MALPOSITIONED UMBILICAL VENOUS CATHETER AFTER THORACOSCOPIC REPAIR OF DIAPHRAGMATIC EVENTRATION

Misplaced umbilical venous catheter

Manjit George1, Koruth Samuel2, Linby Chacko2, Joicy Jojo2

1North Cumbria Integrated Care NHS Trust, UK
2Malankara Orthodox Syrian Church Medical College, Kolenchery, Ernakulam District, Kerala State, India

Submitted (August 27, 2021), Revision received (October 27, 2021), Revision received (November 8, 2021), Accepted date (November 12, 2021)

Corresponding author: Manjit George, Consultant, Department of Anaesthetics, North Cumbria Integrated Care NHS Trust, UK CA28 8JX, Telephone: 00447375321138, E-mail: manjitgeorge@gmail.com

Introduction

Diaphragmatic eventration and congenital diaphragmatic hernia are rare congenital defects of the diaphragm. In congenital diaphragmatic hernia, there is a defect in the diaphragm with a lack of continuity. The diaphragm eventration presents an abnormal elevation of an intact diaphragm. It is the result of incomplete development of the diaphragmatic muscle. Therefore, the diaphragm is formed by the pleuroperitoneal membrane with almost no or sparse muscular component1. Clinically distinguishing them is sometimes difficult, and the correct diagnosis is often made intraoperatively.

The umbilical venous catheter is inserted for venous access in the neonatal age group. This route is associated with lesser complications compared to central venous access. However, catheter tip migration is common and may have disastrous consequences if undetected and not rectified.

Case report

Two-day old term male baby weighing 3.5 kg was posted for thoracoscopic repair of congenital diaphragmatic hernia. The baby was born at 37 weeks +2 days gestational age by cesarean section, indicating fetal distress (decreased fetal heart rate). Antenatal maternal scan at 35 weeks revealed single live intrauterine growth of 27 weeks with polyhydramnios, compressed right heart with prominent vessels in the right thoracic cavity, and non-visualized right hemidiaphragm. The baby had a weak cry at birth, and the heart rate was less than 100 beats/min with an Apgar score of 7/10. The baby’s chest X-ray taken immediately after delivery confirmed the diagnosis (Figure 1).

Given the antenatal ultrasound and chest X-ray findings, the baby was electively intubated immediately after birth with a size 3.5 mm endotracheal tube by the neonatology team with special care to avoid bag and mask ventilation. Further, the baby
was managed in the neonatal intensive care unit, ventilated using high-frequency oscillatory ventilation, and maintained saturation of 96%. An umbilical artery catheter was used for invasive arterial blood pressure monitoring and arterial blood gas sampling, while the umbilical venous catheter was used for venous access. Umbilical venous catheter position was confirmed radiologically with the catheter tip at the level of the ninth thoracic vertebra (Figure 2).

In neonatal intensive care unit, dobutamine 10 mcg/kg/min (0.1 ml/h) and morphine 4 mcg/kg/h infusions were started. Blood reports were normal. An echocardiogram showed heart displaced to the left side with mild tricuspid regurgitation, mild pulmonary artery hypertension, and small patent ductus arteriosus with the left to the right shunt. After initial resuscitation and preoperative optimization, the baby was taken up for thorascoscopic repair of diaphragmatic hernia under general anesthesia on day two.

The baby was transferred from the neonatal intensive care unit to the operating theatre on a transport ventilator. Monitoring included precordial stethoscope, electrocardiogram, noninvasive blood pressure, capnography, pulse oximetry, invasive arterial blood pressure (umbilical arterial line), and urine output in the operating room. After confirming the correct endotracheal tube position, ventilation was initiated using pressure-controlled ventilation mode. Dobutamine and morphine infusion was continued. Anesthesia was maintained with oxygen/air/sevoflurane, and atracurium was used as a muscle relaxant and fentanyl and paracetamol as analgesics. Ringer lactate infusion was given at 10 ml/h.

Thoracoscopy was done using the three-port technique. A five-millimeter 30° port (Covidien, UK) placed just medial to the inferior angle of the scapula, and two ports of 3 mm size (Covidien, UK) were placed in the anterior and posterior axillary line. Thoracoscopy revealed a right-sided eventration of the diaphragm. The anterior and posterior rim of the diaphragm was deficient with a significant anteromedial defect. The eventrated diaphragm had sparse muscle tissue. Therefore, liver and bowel loops were pushed up into the right thoracic cavity. Intraoperative examination detected hypoplastic right lower lung lobe and normal pericardium.

After repositioning the liver into the peritoneal cavity, plication of the diaphragm was done using 2-0 ethibond (Ethicon, New Jersey, USA). The significant anteromedial defect was reinforced by taking two rows of interrupted sutures around the rib and tied extracorporeally. The suction drain with size No. 10 was placed as an intercostal drain and fixed in position. Postoperatively baby was shifted to the neonatal intensive care unit, electively ventilated, and managed with antibiotics, analgesics, and other supportive measures. The intercostal drain was functioning with good column movement and draining serous fluid. X-ray of the abdomen revealed the umbilical vein catheter riding up into the portal vein (Figure 3).

The catheter was pulled out 1 cm, and its optimal position was confirmed by X-ray. We ensured that the catheter tip was pulled back so that the tip of the catheter rested at the level of a ninth thoracic vertebra. On the third postoperative day, the baby was weaned off mechanical ventilation, managed
on high flow oxygen, tolerated feeds, and passed stools. Subsequent chest X-rays revealed expansion of collapsed lung segments. The intercostal drain was removed on the ninth postoperative day. The controlled X-ray did not show any residual pneumothorax. The baby developed port site infection, managed with intravenous antibiotics and daily wound dressing. The baby’s nutritional status improved during the postoperative period and had no evidence of respiratory tract infection. On a postoperative day 21, the baby was discharged in good health. Follow-up was done on an outpatient basis, and the surgical site infection had healed satisfactorily.

Discussion

Diaphragmatic eventration and congenital diaphragmatic herniae are rare congenital defects with 1 in 10,000 and 2.6 per 10,000 live births, respectively, with high morbidity and mortality. Both congenital diaphragmatic hernia and eventration of the diaphragm may be associated with other congenital anomalies and chromosomal abnormalities, which, when present, make the outcome poorer. Both congenital diaphragmatic hernia and diaphragm eventration is more common on the left side. Both congenital diaphragmatic hernia and eventration of the diaphragm can present with respiratory symptoms, owing to varying degrees of lung hypoplasia, which in turn depends on the size of the defect. Diaphragmatic eventration could be congenital or acquired.

Previous case reports show that cases of eventration of the diaphragm have been misdiagnosed as congenital diaphragmatic hernia, only to be later confirmed on thoracoscopy. In our baby case, thoracoscopy revealed a right-sided eventration of the diaphragm. Respiratory distress is seen in both congenital diaphragmatic hernia and eventration.
of the diaphragm from compression of lungs by abdominal organs or as a result of lung hypoplasia in utero. Radiological imaging may also be similar.4

Migration following umbilical vein catheter insertion is common, and awareness about this is essential, and reevaluation and rectification are recommended5. Inadvertent migration of umbilical vein catheter resulting in malpositioned catheter has been reported previously in literature5. In the postoperative phase, we noticed the riding up of umbilical vein catheter into the portal vein on abdominal x-ray. Causes of the catheter migration include lung expansion and diaphragmatic descent, weight changes in the neonate or changes in ventilation modes6,7. In our case, it was probably attributed to the return of the liver to the standard anatomical position after correction of the diaphragmatic defect. This could happen with the repair of diaphragmatic hernia too. Malpositioned umbilical vein catheters can cause hepatic necrosis, liver hematoma, left atrial thrombus, pericardial effusion causing tamponade, and arrhythmias6. The catheter was pulled back by 1 cm, and the correct position was confirmed by X-ray. According to the vertebral level method, the correct position of the umbilical vein catheter on chest x-ray was defined as an umbilical vein catheter with its tip projecting on the ninth or tenth thoracic vertebral

Figure 2: Umbilical vein catheter tip in the position indicated with white arrow
level. The position was determined too low when the catheter tip projected below the tenth thoracic vertebral level and too high projecting above the ninth thoracic vertebral level.

**Conclusion**

Congenital diaphragmatic hernia and eventration of the diaphragm, although different entities, owing to their similar clinical presentations, are often misdiagnosed even with radiological imaging. Checking the position of the umbilical vein catheter following repair of congenital diaphragmatic hernia and eventration of the diaphragm is essential to detect malposition. This might happen following the return of the liver to its anatomical position post-correction of the diaphragmatic defect. A malposition of umbilical venous catheter should be corrected by withdrawing the tip to the appropriate position.

**References**


