Pneumomediastinum in a term neonate: A rare clinical entity

This article details the case of a term Caucasian female neonate with pneumomediastinum, outlining the clinical presentation, diagnostic challenges and management strategies. The discussion highlights the importance of timely intervention, the role of conservative management and the necessity for continuous monitoring to ensure successful outcomes in neonatal pneumomediastinum cases.

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Key points

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1. Pneumomediastinum is a rare but significant condition in term newborns, often presenting with respiratory distress.
2. Diagnosis relies heavily on chest X-rays, with key radiological features aiding in differentiation from other conditions.
3. Conservative management, including supportive care and close monitoring, can lead to resolution without the need for invasive procedures.
4. Early recognition and intervention are critical to managing pneumomediastinum effectively, minimising complications and improving outcomes.

Introduction

Pneumomediastinum is rare in term newborn babies.[1] It is a mediastinal air leak that occurs because of ruptured alveoli air passing through the perivascular sheaths to the hilum. It is a rare cause of neonatal deaths.

The estimated incidence of pneumomediastinum is 0.025 per 1,000 live births and it is more common in preterm babies.[2] Pneumomediastinum can occur spontaneously,[3] or it can be associated with predisposing factors such as a vigorous resuscitation, respiratory distress syndrome, surfactant administration, pneumonia, mechanical ventilation or meconium aspiration syndrome.[4,5]

It can be asymptomatic but usually presents with respiratory distress. Chest X-rays in the anteroposterior and lateral cubitus views are sufficient to make a diagnosis. Conservative management with supportive care usually leads to good outcomes.[6]

This case is of interest not just because pneumomediastinum are rare in term babies but of also due to its peculiar radiological presentation.

Case report

A 38 weeks and three days' gestation Caucasian female was born via normal vaginal delivery. She was in good condition at birth with Apgar scores of 8, 9, 9 at 1, 5 and 10 minutes respectively. She did not need resuscitation. Her birth weight was 3,342g and there were no concerns at delivery, so she was transferred to the postnatal ward. At four hours after birth she was noticed to have increased work of breathing. She was grunting and looked dusky. She was transferred to NICU for a review.

Initial blood gas showed mixed respiratory and metabolic acidosis (pH 7.05, pCO_2 11.2kPa, pO_2 4.8kPa, lactic 5.9mmol/L, HCO_3 14.9mmol/l, BE-10.1mmol/L) and oxygen saturation was 68%. She was started on high flow nasal cannula oxygen at 6L/min. She was kept nil by mouth and started on 10% glucose intravenously (IV). She was investigated for early onset infection and started on antibiotics (IV benzylpenicillin 25mg/kg and IV gentamicin 5mg/kg).

Chest X-ray carried out at five hours of age showed hazy opacification on the left lung, with a clear right lung.

Her oxygen requirements continued to increase and at eight hours after birth she was intubated. The intubation (size 3.5mm endotracheal tube [ETT] placed at 9cm at the lips) was uncomplicated and performed on the first attempt by an experienced practitioner. She was ventilated with pressure-controlled, volume-guarantee mode on the Drager VN500 baby log ventilator with tidal volume set at 5ml/kg and rate of 50. She was needing 40% oxygen to maintain her oxygen saturations. She received 200mg/kg of surfactant.

The repeat chest X-ray showed the ETT tip to be at the thoracic inlet and the nasogastric tube tip to be in the stomach. There were diffuse granular opacifications throughout both lungs. An initial diagnosis of suspected sepsis with respiratory distress

syndrome (RDS) was made. As she improved, her ventilatory support was gradually weaned and she was able to be extubated the next day.

She remained well and started breastfeeding. However, at 36 hours post-extubation she had increasing respiratory distress and an increased oxygen requirement. She was returned to high flow oxygen at 6L/min and 60% oxygen. Repeat chest X-ray demonstrated a large pneumomediastinum with background changes of RDS and no pneumothorax. She was reintubated and given a second dose of 200mg/kg of surfactant and put back on the mechanical ventilator. She was given muscle relaxants and sedated with a morphine infusion. She was given IV fluids and central venous and arterial access were established via the umbilicus. Her blood pressure and other cardiovascular parameters remained stable. She continued antibiotics for five days, although apart from a small rise in her C-reactive protein, there were no markers for infection.

Serial chest X-rays, including a lateral decubitus film, were all suggestive of a large pneumomediastinum. The ETT was dislodged the next day and although she appeared to be comfortable in 40% ambient oxygen, she was reintubated and ventilated, as the chest X-ray showed persistent large pneumomediastinum.

After several unsuccessful extubation attempts at the Royal Derby Hospital (RDH), she was transferred to Jessop Wing maternity hospital on day four of life. At Jessop Wing, her chest X-ray showed significant pneumomediastinum for which she was ventilated for seven days. Her endotracheal tube secretions revealed a heavy growth of *Acinetobacter baumanii*, which responded well to gentamicin and meropenem.

Fortunately, her blood cultures came back negative after five days and by day six of admission, a follow-up chest X-ray showed the pneumomediastinum had fully resolved. She was successfully extubated the next day and she received a dose of dexamethasone to support her after the multiple reintubations.

Self-ventilating comfortably with good blood gas readings, she was transferred to her home unit, where she fully established breastfeeding and weight gain.

She was subsequently discharged and is doing well. She has since been reviewed in clinic and is asymptomatic.

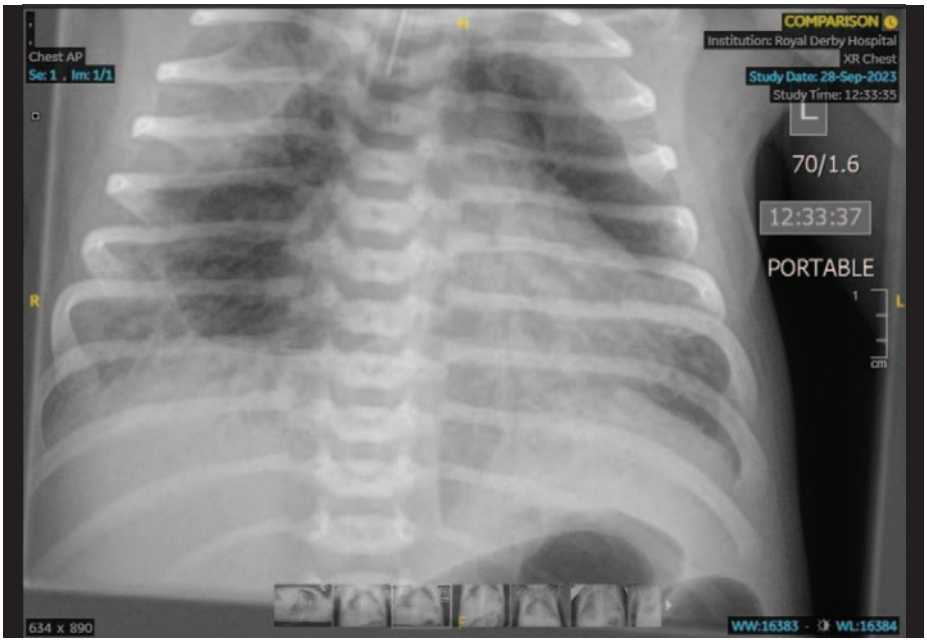

FIGURE 1 Chest X-ray shows a halo around the heart border which excludes the diaphragmatic border of the heart in the anteroposterior view and a retrosternal translucency in the lateral view.

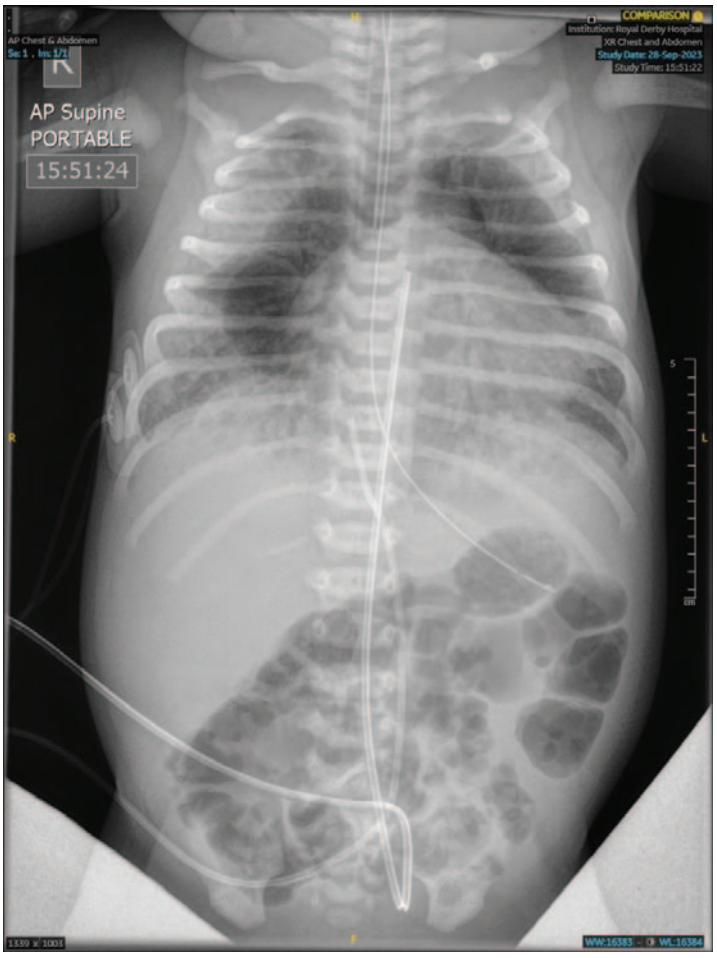

FIGURE 2 Other diagnostic signs on chest X-ray include the crescentic appearance of the thymus and the 'spinnaker sail sign'

Discussion

Pneumomediastinum is an uncommon cause of respiratory distress in term babies.[1] The plausible mechanisms underlying its occurrence were first described by Macklin in 1939[7] as an increased pressure gradient between the alveoli and the pulmonary interstitium resulting in alveolar rupture into the perivascular space. Subsequently, dissection of air along the perivascular sheaths towards the hilum leads to air leak into the

mediastinal space. The usual trigger is positive pressure ventilation in combination with an underlying abnormality such as surfactant deficiency or meconium aspiration syndrome, which make the alveoli fragile and prone to rupture. This baby had RDS, received surfactant and required positive pressure ventilation via a mechanical ventilator prior to developing the pneumo-mediastinum. However, we were unable to identify any period of higher pressure ventilation during this course.

The key diagnostic features on the chest X-ray show a halo around the heart border, which excludes the diaphragmatic border of the heart in the anteroposterior view and a retrosternal translucency in the lateral view. The features were clear in our index case. Other diagnostic signs on chest X-ray include the crescentic appearance of the thymus and the 'spinnaker sail sign'. In some cases of diagnostic uncertainty, a CT scan and/or ultrasound scan may be needed to rule out suspected mediastinal masses.

Most of the cases of neonatal pneumomediastinum show spontaneous resolution with only conservative management and close observation.[6] Few babies need high frequency ventilation and drainage.[8-10] Fortunately, our baby needed no interventions and was managed conservatively as serial chest X-rays post extubation showed remarkable improvement.

Conclusion

The successful management of this condition emphasises the importance of timely intervention and close monitoring, especially in the presence of predisposing factors such as RDS and positive pressure ventilation.

While conservative management proved effective in our case, the diagnostic complexities, including specific radiological features, emphasise the need for a thorough evaluation to avoid misdiagnosis.

The need for continued research and awareness is crucial to enhance understanding and management strategies for neonatal pneumomediastinum.

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