An Autopsy Case of Alveolar Capillary Dysplasia

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Patient

Chief complaint: A full term, newborn girl developed respiratory distress shortly after birth

Hospital course: The term baby developed respiratory distress and worsening cardiopulmonary function secondary to meconium aspiration. She received maximum cardiopulmonary support including the oscillator, nitric oxide, and vasoactive agents. Echocardiogram showed normal anatomy of cardiovascular system, patent ductus arterosus. Despite maximum support, she continues to show a worsening trend in her oxygenation. She was started on Extracorporeal membrane oxygenation (ECMO) on the second day, and was separated 1 week later. Two weeks after birth, the patient had increased shunting with stimulation and acidosis requiring increased FiO_2 and ventilatory support. Respiratory surfactant was given and despite aggressive treatment and resuscitation, the patient expired after 20 days.

Lab data

CBC

- WBC 21.5 B/L
  87% granulocytes
  6% lymphocytes
  7% monocytes
  Increased bands
- Hg 15.7 g/DL

BLOOD CULTURES

Staphylococcus Aureus,
Tracheal Aspirates

E. coli and Staphylococcus Aureus
Arterial Blood Gas

pH 7.4
Total CO_2 19.0
pO_2 81

Autopsy Findings

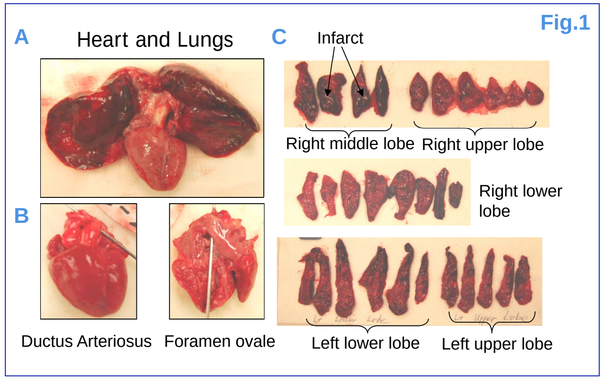

Figure 1. Gross examination of the heart and lungs. A, The lung weight is increased. The right ventricle is hypertrophic. B, Patent ductus arteriosus and foramen ovale are guided by a probe. C, Serial sections of the lung reveals nodular cut surface and a infarct (Arrow).

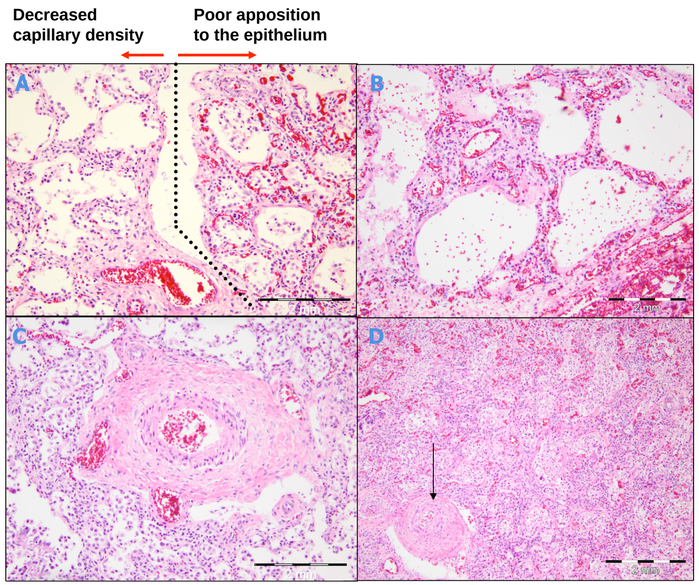

Figure 2. Microscopic findings of the lungs (HE staining) A, In the thickened alveolar septae, the left segment has decreased capillary density; the capillaries in the right segment are located far away from the epithelial surface. B, The vessels present are poorly apposed to the epithelial surface. C, Pulmonary veins in the wall of pulmonary artery. D, Medial hypertrophy of pulmonary artery (Arrow). Scale bars, 2mm.

Discussions

This 20-day-old newborn baby was born at full term. Since birth, he had struggled with severe respiratory distress. Despite aggressive treatment including steroid, antibiotics, ECMO, and surfactant, he expired. Significant pathologic findings of the lungs are revealed as alveolar capillary dysplasia (ACD), with bronchopneumonia, focal infarction, and diffuse alveolar damage. The findings of patent ductus arteriosus and patent foramen ovale, are consistent with the patient's clinical course of persistent fetal circulation, which is associated with persistent pulmonary hypertension caused by poor development of alveolar capillary and muscular thickening in the small pulmonary arteries. His pulmonary infections are associated with staphylococcus aureus which was detected in both blood and sputum.

ACD is an uncommon cause of irreversible persistent pulmonary hypertension in full-term newborn. In ACD, there is a failure of formation of air - blood barrier in addition to misalignment of pulmonary veins, which is also referred to as alveolar capillary dysplasia with misalignment of the pulmonary veins (ACD/MPV) (1). The incidence of ACD/MPV is not yet known, as the definitive diagnosis of ACD/MPV currently depends on histological examination of lung tissue. Gene changes in Forkhead Box-F1 (*FOXF1)*, a transcription factor gene critical for vascular development, are believed to be responsible for the pathogenesis of ACD based on gene sequencing in a cohort of 18 patients with the disease (2) and animal models of ACD (3). Although typically fatal, a recent study (4) proposed that the severity of disruption in capillary density and the lack of contact with the alveolar epithelium may be two major factors that can determine clinical course and prognosis. Therefore recognition of this entity in a lung biopsy following clinical findings of persistent fetal circulation is important, because it may contribute to making the best medical decision.

References

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