CASE REPORT

Bilateral congenital cystic adenomatoid malformation, Stocker's type III with associated findings and review of literature

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ABSTRACT

Congenital cystic adenomatoid malformation (CCAM) of the lung, Stocker's type III is a rare anomaly characterized by replacement of normal pulmonary tissue with cysts of variable size and distribution. We report here a 16-week stillborn fetus with Stocker's type III bilateral CCAM involving the entire lungs. The additional associated malformations included collapsed nasal bridge, low set ears, malformed ears, absence of neck folds, absence of nipples and areolas, tracheal stenosis, fetal hydrops and small heart. The pathogenesis, radiological findings, pathological findings and prognosis of CCAM are discussed along with review of literature.

KEY WORDS: Congenital, cystic adenomatoid malformation, lung

INTRODUCTION

Ch'in and Tang[1] first described congenital cystic adenomatoid malformation (CCAM) as a distinct entity in 1949. Congenital cystic adenomatoid malformation of lung is a pulmonary developmental hamartomatous abnormality arising from an overgrowth of the terminal respiratory bronchioles. Congenital cystic adenomatoid malformation has been divided into three types (Type I, II, III) based on their pathological characteristics. Types 1 and II are the most common variants, while Type III is a rare variant.[2] The condition may be bilateral involving all lung tissue, but in the vast majority of cases it is confined to a single lung or lobe. It may be associated with congenital anomalies like bronchogenic cysts, bronchopulmonary sequestration and esophageal cysts.[3] Although preoperative imaging studies may suggest a possibility of CCAM, however histopathological examination remains the main stay of diagnosis. We report here such a rare case of type III bilateral CCAM involving the entire lungs with associated anomalies.

CASE REPORT

A 26-year-old-primigravida of 16 weeks gestation, presented with pain abdomen at the department of obstetrics. Examination of the abdomen revealed tenderness and absent fetal heart sounds. Ultrasonography revealed bilateral large hyper-echogenic lungs with flat/ inversion diaphragm [Figure 1a], compressed small anteriorly displaced non-functioning heart due to enlarged lungs [Figure 1b], non-immune hydrops (fluid in body wall [Figure 1c], nape of neck [Figure 1d], limb edema, pleural and pericardial effusions), skull showing edema with positive Spalding sign and areas of breakdown [Figure 1e].

The 16-week dead male fetus was delivered by using inducing agents. Based on the radiological and clinical parameters, a probable diagnosis of congenital high airway obstruction syndrome (CHAOS) was considered.

Pathological findings

External examination revealed microcephaly, low set ears, malformed auricle, narrow inter-papillary distance, absence of neck fold, narrow chest, absence of nipples and areola and distended abdomen [Figure 2a].

Gross examination showed bilateral enlarged lungs [Figure 2b] displacing the heart anteriorly. The heart appeared small and there was stenosis of the trachea [Figure 2c]. Both the lungs appeared solid without obvious cysts. Cut section showed multiple minute cysts less than 2 mm in diameter.

Microscopy revealed bronchiole-like structures lined by ciliated cuboidal epithelium, and sequestered by numerous alveolus-sized cystic structures lined by non-ciliated cuboidal epithelium [Figure 3]. The bronchial cartilage surrounding the cysts and bronchial tubular glands were absent. The lumen of the trachea was replaced by fibrocollagenous stroma with some cysts and vascular spaces [Figure 4]. A final diagnosis of type III CCAM was considered after correlation of clinical, radiological and pathological findings.

DISCUSSION

Congenital cystic adenomatoid malformation (CCAM) of the lung is a rare anomaly
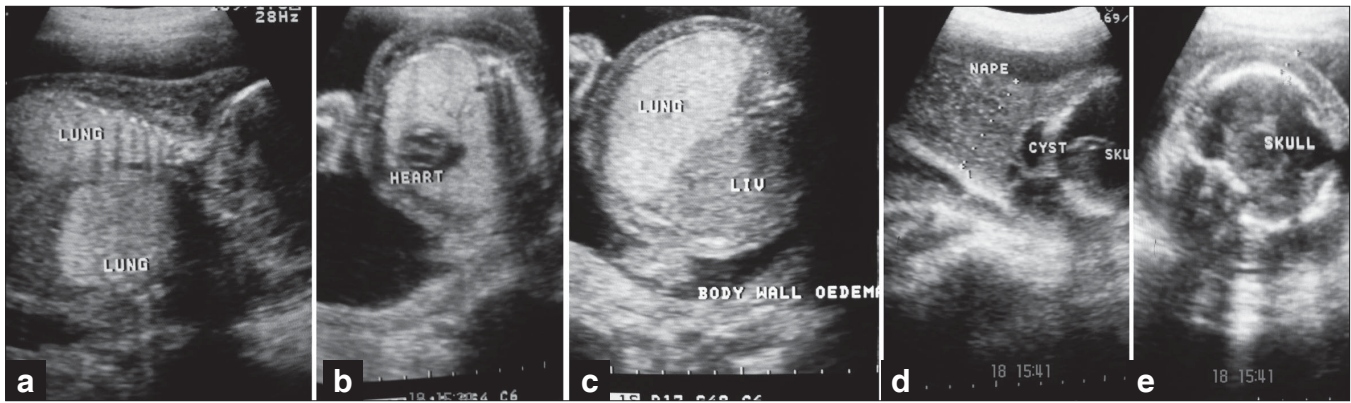
Figure 1: (a) Sonography showing bilateral large hyperechogenic lungs with flat/inversion diaphragm, (b) Sonography showing compressed small anteriorly displaced non-functioning heart due to enlarged lungs, (c) Sonography revealing fluid in body wall, (d) Sonography revealing fluid in nape of neck, (e) Sonography revealing fluid skull edema with positive Spalding sign and areas of breakdown
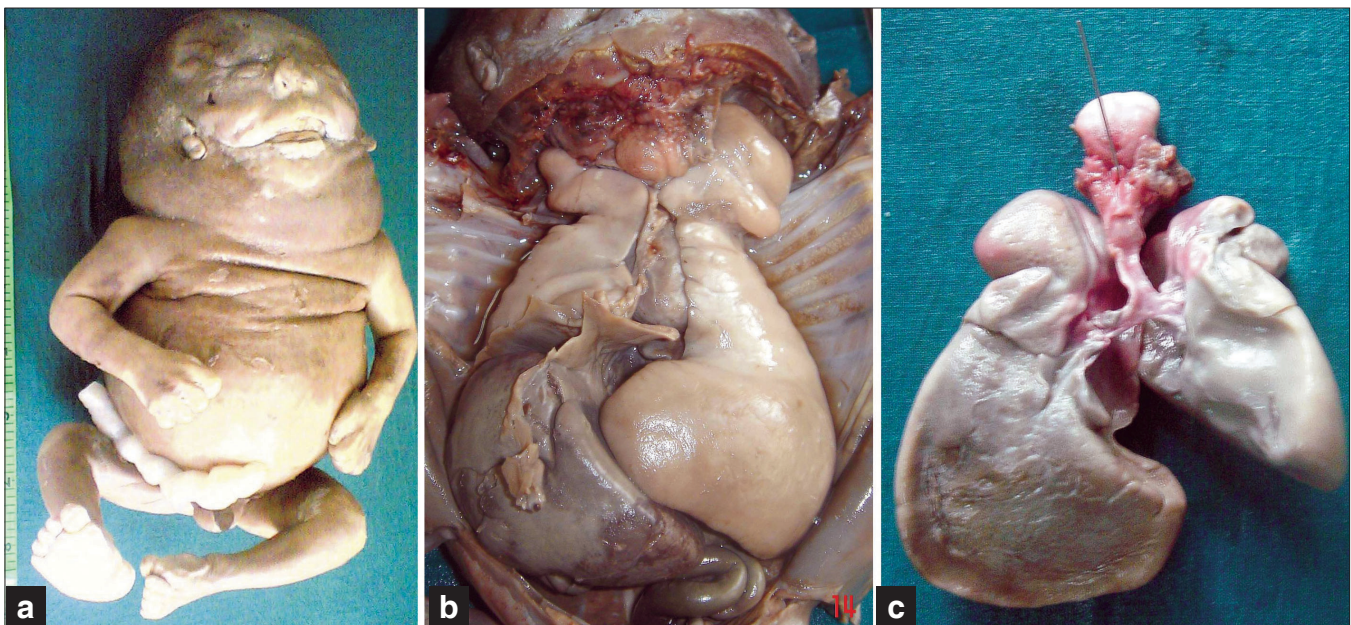

Figure 2: (a) External examination showing microcephaly, low set ears, malformed auricle, narrow interpapillary distance, absence of neck fold, narrow chest, absence of nipples and areola, distended abdomen, (b) *In-situ* examination identifying bilateral enlarged lungs displacing the heart anteriorly and midline, (c) Gross examination showing stenosis of the trachea

of fetal development. It is believed to result from focal arrest in fetal lung development before the seventh week of gestation secondary to a variety of pulmonary insults. Depending on the time and type of insult, 4–26% of cases can be associated with other congenital abnormalities. Congenital cystic adenomatoid malformation differs from normal lung tissue because of lack in well-defined intrapulmonary bronchial system.[4] Routine prenatal ultrasonography has increased the frequency of prenatal diagnosis of congenital cystic lung malformation including CCAM. Radiologically, CCAM appears as abnormal air, air/fluid filled cyst or fluid-filled/solid-appearing cysts.[5]

Congenital cystic adenomatoid malformation is diagnosed by five characteristic pathological features including:[2] (1) absence of bronchial cartilage (unless it is trapped within the lesion); (2) absence

of bronchial tubular glands; (3) presence of tall columnar mucinous epithelium; (4) overproduction of terminal bronchiolar structures without alveolar differentiation, except in the subpleural areas and (5) massive enlargement of the affected lobe that displaces other thoracic structures. All these characteristic features were seen in our case.

Also, depending on the size of the cysts, CCAM is subdivided into three major types by Stocker.[2] Type I lesions, the most common, are composed of one or more cysts measuring 2–10 cm in diameter. Larger cysts are often accompanied by smaller cysts, and their walls contain muscle, elastic or fibrous tissue. Cysts are frequently lined by pseudostratified columnar epithelial cells, which occasionally produce mucin. Mucinogenic differentiation is unique to this subtype of CCAM. Type II lesions are characterized by small relatively uniform cysts resembling bronchioles. These cysts are lined by
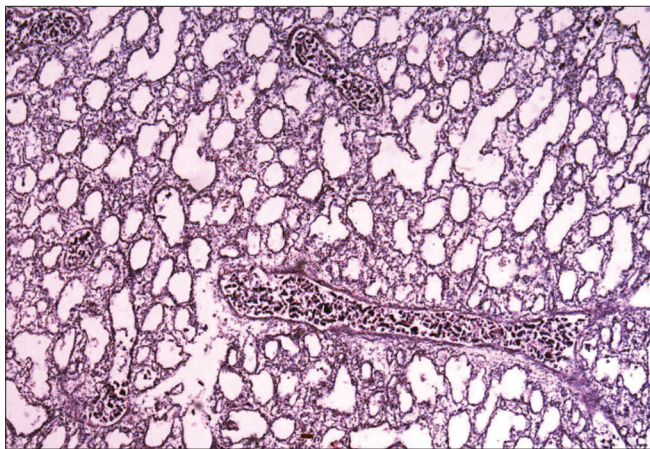
Figure 3: Microscopy showing bronchiole-like structures lined by ciliated cuboidal epithelium, and sequestered by numerous alveolus-sized cystic structures lined by non-ciliated cuboidal epithelium. The bronchial cartilage surrounding the cysts and bronchial tubular glands were absent. (H and E, ×100)

Figure 4: Microscopy showing the lumen of trachea completely replaced by fibrocollagenous stroma with some cysts and vascular spaces. (H and E, ×50)

cuboidal to columnar epithelium and have a thin fibromuscular wall. The cysts generally measure 0.5–2 cm in diameter. Type III lesions consist of microscopic, adenomatoid cysts and are grossly a solid mass without obvious cyst formation. Microscopic adenomatoid cysts are present.

The association of recombinant chromosome 18 in association with CCAM has been described.[6] Karyotyping study was done in our case, which did not reveal any cytogenetic abnormality. In about 10% of CCAM, there are additional associated malformations. The common associated findings are bronchopulmonary sequestration, polyhydramnios, hydrops (common in microcystic form) and placentomegaly (in case of hydrops).[3] Various other associated congenital anomalies have been reported like renal abnormalities (bilateral renal agenesis), abdominal wall abnormalities, central nervous system defects (hydrocephalus), spinal deformities (cervical spine/thoracic spine), gastrointestinal defects (diaphragmatic hernia, jejunal atresia, tracheoesophageal fistula), cardiac anomalies and anomalies of the great vessels (ventricular septal defect, tetralogy of Fallot, truncus arteriosus) and sirenomelia (including agenesis of ureters, bladder, urethra, uterus, cervix, vagina, gallbladder, descending colon, sigmoid colon and rectum, and imperforate anus).[7,8] In our case, the associated anomalies included collapsed nasal bridge, low set ears, malformed ears, absence of neck folds, absence of nipples and areolas, tracheal stenosis and fetal hydrops. Unilateral lesions are often associated with deviation of the mediastinum in the contralateral side. In bilateral disease, the heart may be severely compressed, and this is usually associated with ascites from venocaval obstruction or cardiac compression.[7]

The prognosis primarily depends on the type of the lesion. The type I lesion carries the best prognosis overall. The prognosis in type II lesions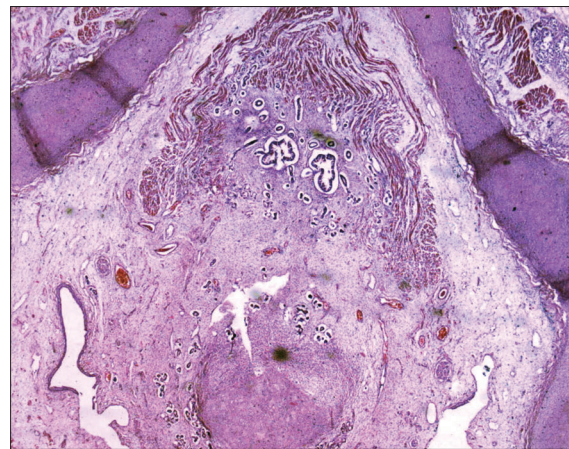 is dependent upon associated anomalies, which can be severe and are often related to genitourinary tract, with renal agenesis or dysgenesis. The type III lesions carry a poor prognosis, as they are usually large and generally present early with cardiovascular compromise, or in utero with hydrops. The factors indicating poor prognosis include bilateral lung involvement, associated hydrops and presence of other congenital anomalies,[9] which was seen in our case.

REFERENCES

1. Ch'in KY, Tang MY. Congenital adenomatoid malformation of one lobe of lung with general anasarca. Arch Pathol (Chic) 1949;48:221-9.
2. Stocker JT, Madewell JE, Drake RM. Congenital cystic adenomatoid malformation of the lung. Classification and morphologic spectrum. Hum Pathol 1977;8:55-71.
3. MacKenzie TC, Guttenberg ME, Nisenbaum HL, Johnson MP, Adzick NS. A fetal lung lesion consisting of bronchogenic cyst, bronchopulmonary sequestration and congenital cystic adenomatoid malformation: the missing link? Fetal Diagn Ther 2001;16:193-5.
4. Sittig SE, Asay GF. Congenital cystic adenomatoid malformation in the newborn: two case studies and review of literature. Respir Care 2000;45:188-95.
5. Kim WS, Lee KS, Kim IO, Suh YL, Im JG, Yeon KM, *et al.* Congenital cystic adenomatoid malformation of the lung: CT-pathologic correlation. AJR Am J Roentgenol 1997;168:47-53.
6. Roberts D, Sweeney E, Walkinshaw S. Congenital cystic adenomatoid malformation of the lung coexisting with recombinant chromosome 18. A case report. Fetal Diagn Ther 2001;16:65-7.
7. Mahle WT, Rychik J, Tian ZY, Cohen MS, Howell LJ, Crombleholme TM, *et al.* Echocardiographic evaluation of the fetus with congenital cystic adenomatoid malformation. Ultrasound Obstet Gynecol 2000;16:620-4.
8. Hernanz-Schulman M. Cysts and cyst-like lesions of the lung. Radiol Clin North Am 1993;31:631-4.
9. Bunduki V, Ruano R, da Silva MM, Miguelez J, Miyadahira S, Maksoud JG, *et al.* Prognostic factors associated with congenital cystic adenomatoid malformation of the lung. Prenat Diagn 2000;20:459-64.