11) Isaacs J. H., Ross F. H. jr.: *Am. J. Obst. Gyn., 131,* 410, 1978.
12) Miyazawa K.: *Obst. Gyn., 61,* 148, 1983.
13) De Palo G., Stefanon B.: "Carcinoma dell'endometrio". In: Farmitalia Carlo Erba ed., Documenti Scientifici, 2nd ed., Milano, 1983, 31 pp.
14) Hudd H. J., Davidson B. J., Framar A. M., Shamonski I. M., Lagasse L. D., Ballon S. C.: *Am. J. Obst. Gyn., 136,* 859, 1980.
15) Franceschi S., La Vecchia C., Mangioni C.: *Argom. Oncol., 2,* 325, 1981.
16) Schully R. E.: *Cancer, 48,* 531, 1981.
17) Hthcock E. W. jr., Williams G. A., Engelhardt S. M. III, Murphy A. L.: *Am. J. Obst. Gyn., 102,* 205, 1974.
18) Waterhouse J. Muir C., Shanmugaratnaw K., Powell J.: "Cancer incidence in five continents", vol. IV. IARC Scienfic Publications, no. 42, Lyon, 1983.
19) Giarelli L., Di Bonito L., Patriarca S., Delendi M., Gerin D.: *Minerva Ginecol., 39,* 41, 1987.
20) MacKenzie I. Z., Bibby J. G.: *Lancet, 2,* 566, 1978.
21) Alberico S., Elia A., Dal Corso L., Mandruzzato G. P., Di Bonito L., Patriarca S.: *Eur. J. Gyn. Oncol., 7, 135,* 1986.
22) Vuopala S.: *Acta Obst. Gyn. Scand., 70* (suppl.), 1, 1977.
22) Franceschi S., La Vecchia C., Gallus G. *et al.*: *Cancer, 50,* 220, 1982.

PRENATAL DIAGNOSIS OF CYSTIC ADENOMATOID MALFORMATION OF THE LUNG

F. VESCE - P. GARUTTI - E. GRANDI (*)
G. PERRI - G. ALTAVILLA (*)
Dept. of Obstetrics and Gynecology - University of Ferrara (Italy)
(*) Institute of Pathology - University of Ferrara (Italy)

Summary: Two cases of congenital cystic adenomatoid malformation of the lung (CCAML) are described. In the light of recent literature the prenatal diagnosis and management are discussed.

Key words: Prenatal diagnosis; Obstetrical management; Adenomatoid malformation.

INTRODUCTION

Congenital cystic adenomatoid malformation (CCAML) is a rare disease of the lung ([1, 2, 3]). The majority of about 200 cases, that have been described up to now, were diagnosed after birth, prenatal ultrasonographic diagnosis being reported in only 20 cases ([1, 4, 5]).

Based on the size of the cysts, the lesion is classified into three types with different prognosis, which is also influenced by other possible associated defects ([6, 7, 8]). The perinatal outcome is characterized by intrauterine death in 14% of the cases; premature delivery is common in the presence of fetal hydrops and hydramnios; severe respiratory distress in 70-80% of the cases require surgical therapy immediately after birth ([9–14]). The newborn with less extensive lesions show mild episodes of cyanosis and recurrent pulmonary infections during the first year of life ([11, 14–17]).

In the present report two cases of CCAML that were prenatally diagnosed in the Department of Obstetrics and Gynecology of Ferrara University are reported.

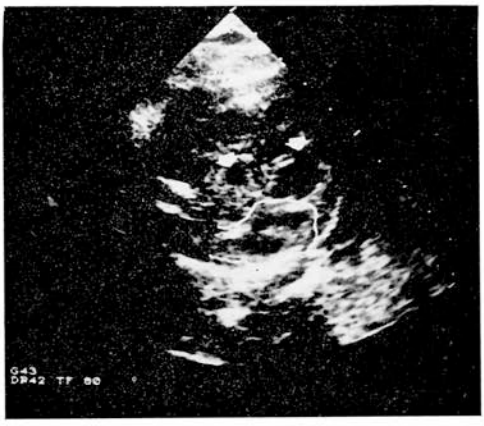

Fig. 1. — Transversal scan of thorax showing two pulmonary cysts (arrows). Heart (continuous line) is shifted to the right side of chest.

Fig. 2. — The arrow points to the mass arising from the lower lobe of the left lung (L). Thymus (T), Windpipe (W), Heart (H), Right lung (R).

CASE REPORTS

Case n. 1 (CCAML type I)

C. A., 19 years old. Her sister was affected by hydrocephaly of unknown origin, while she had a negative past medical history. At the 22nd week of her first pregnancy an echographic examination revealed a left pulmonary mass with displacement of the heart towards the right side of the chest (Fig. 1 a). The mass was characterized by the presence of multiple transonic round areas, measuring up to 3 cm in diameter.

There were no other malformations; the head and abdominal diameters showed a normal fetal growth; the amount of amniotic fluid was normal.

A type I CCAM of the left lung was suspected. Amniotic alpha-fetoprotein level and fetal karyotype resulted normal. A termination of the pregnancy was requested by the parents.

Pathologic findings

Female fetus, 510 g of weight. The cut surface of the enlarged lower lobe of the left lung showed the existence of cystic cavities reaching 3 cm in diameter, filled with clear pink fluid (Fig. 1 b).

The rest of the parenchyma was diffusely microcystic, while the superior lobe and the right lung were not involved. There was a shift of the mediastinum to the right. No other macroscopical abnormalities were found.

The histological picture showed a columnar ciliated epithelial lining of the larger cysts with papillary projections, overlying a layer of fibrous tissue containing smooth muscle and rare cartilage plates. Alveolus-like formations, lined by cuboidal epithelium, were observed among the cysts, interspersed in a loose connective tissue (Fig. 1 c).

These alveolar structures were separated by poorly vascularized adenomatous fibrous septa rich in fibroblasts.

Case n. 2 (CCAML type III).

P. R., 25 years old, was referred for a routine echography at the 24th week of her second pregnancy. The fetal thorax was entirely occupied by a homogenous highly echogenic mass, the heart being displaced towards the left chest wall (Fig. 2 a). There was no identifiable normal pulmonary parenchyma. The abdomen was overfilled with massive ascites with no other signs of fetal hydrops. The intestinal loops seemed not to herniate into the chest cavity (Fig. 1 b). Biparietal diameter as well as femor length were normal for gestational age and no other anomalies were found. CCAM type III of the lung was suspected. By amniocentesis a normal level

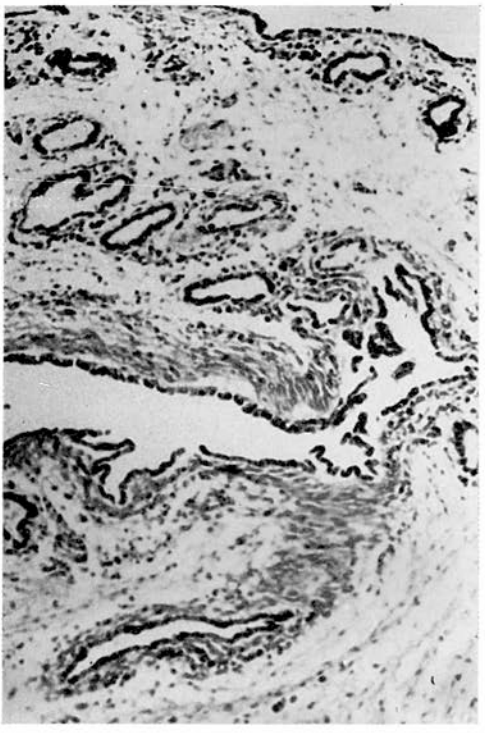

Fig. 3. — Cystic formation lined by epithelium lying over a thick fibromuscular layer (EE 80×).

of alpha-fetoprotein and a 46 XY 1qh$^+$ karyotype was demonstrated. Termination of pregnancy was requested by the parents.

Pathologic findings

Male fetus, 900 g of weight. The thoracic cavity was occupied by an irregular nodular mass, 6×5×3.5 cm, arising from the upper lobe of the right lung. The mass was surfaced by normal pleura (Fig. 2 c). It was connected with the main bronchial duct by means of a thin blind pedicle. The hilum vessels were normal. The rest of the pulmonary parenchyma was compressed, with the mediastinum shifted to the opposite side. The cut surface showed irregular microcystic lobules. The peritoneal cavity contained 100 cc of clear yellow fluid. There were no other associated anomalies.

At the histological examination (Fig. 2 d) the lesion consisted of bronchiole-like structures of irregular size and shape, lined by either cuboidal or columnar epithelium occasionally found to lie over a thin fibromuscular layer. Among the bronchiolar type structures there were cavities of alveolar size lined by cuboidal epithelium. The cavities were separated by septa of loose, poorly vacsularized connective tissue that appeared much thicker compared to that of normal fetal lung. No cartilage plates were found.

DISCUSSION

CCAML type I is represented by either one or few cysts of >2 cm diameter; it is not associated with other malformations ([1, 6]). In the cases when only one large cyst is present, it is possible to drain its fluid content into the amniotic cavity by the application of a catheter under echopraphic control. Such a procedure is performed with the aim of decompressing the normal lung as well as of obtaining a better evaluation of the chest condition ([5–18]).

CCAML type II is characterized by multiple cysts of <1 cm diameter. It is frequently associated with other life-threatening malformations ([1, 6]).

CCAML type III is formed by a solid mass that involves one or more lobes. It does not appear to be associated with other malformations ([1, 6]). Therefore it might be cured at least in cases of limited extent. Surgical exeresis has been successfully performed after birth in some cases ([19]).

Prenatal diagnosis is thought to be of great value for the assessment as well as for the treatment of the disease. However there are no accepted ultrasonographic criteria to differentiate it from other solid lesions, such as extralobar sequestration, rhabdomyoma and mediastinal teratoma, or from cystic pulmonary lesions such as bronchiectasis and bronchial cyst ([2, 11, 20, 21]). Sonography accurately detects the size and echogenicity of the lesions: these are useful characteristics for identifying the type of the disease. Unilateral forms can be suspected when mediastinal shift is present. On the other hand the compression of the normal pulmonary tissue hin-

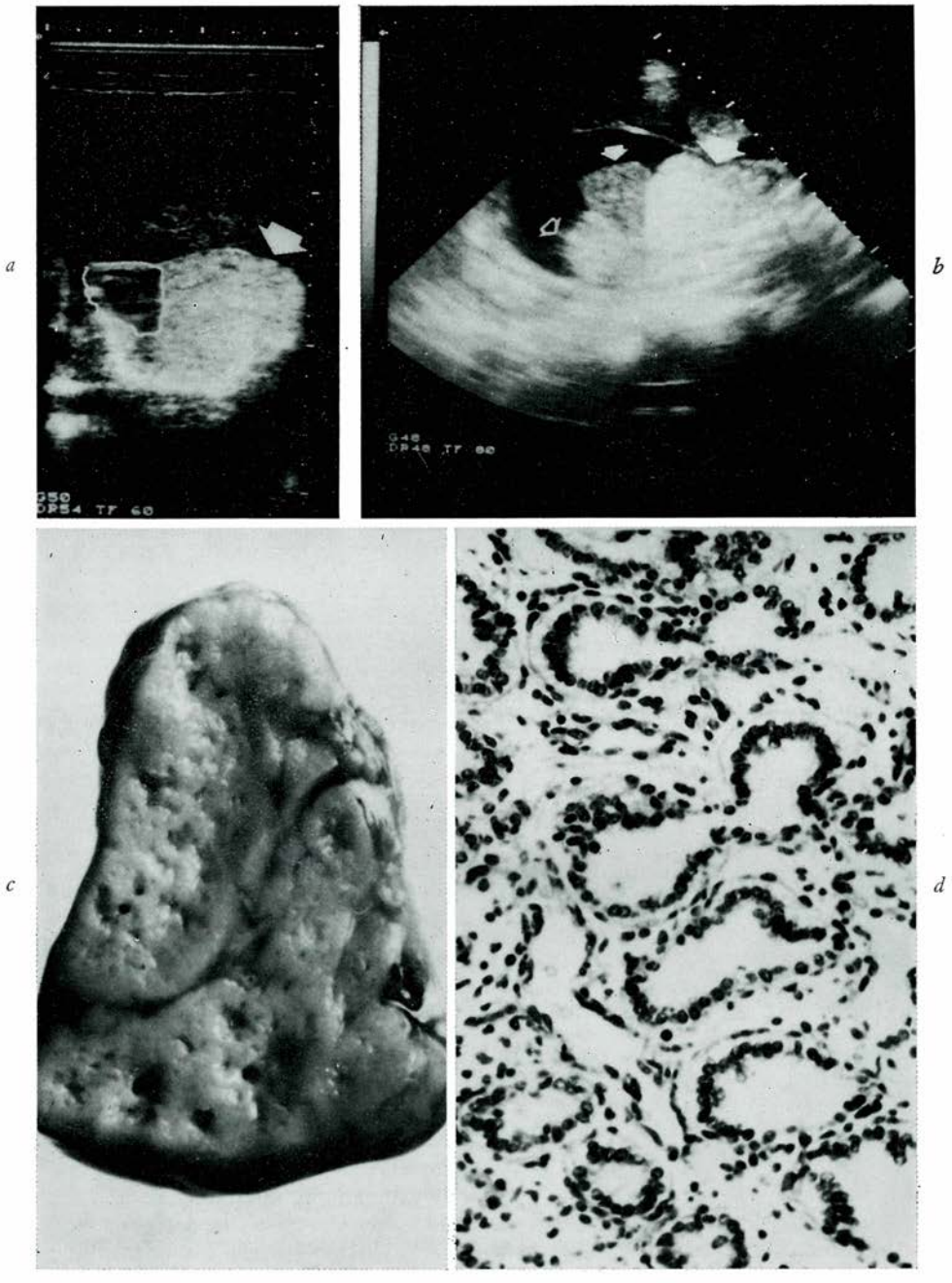

Fig. 4. — *a*) Oblique scan of fetal body. Pulmonary mass is represented by hyperechoid solid area (arrow). Heart is shifted to the left (continuous line). *b*) Longitudinal scan showing thoracic mass (larger arrow); in abdomen a large amount of ascites is seen, with liver (arrow) and intestinal loops (open arrow). *c*) Solid aspect of the cut surface of the mass. The existence of an irregular lobular picture and the presence of small cysts can be noted. *d*) Bronchiole-like structures lined by columner-cuboidal epithelium (EE 200×).

ders its sonographic assessment. Therefore it might be impossible to understand whether the disease involves one or more lobes.

In our cases ultrasound examination did not contribute to the differentiation of the lesion from other pathologic conditions of the thorax. Unilateral extension was suspected, the heart being displaced towards the opposite chest-wall. Pathologic examination revealed the involvement of only one lobe in both cases. Furthermore in case 2 a differential diagnosis with extralobar sequestration was considered, due to the lack of a clear comunication of the mass with the tracheobronchial tree. However the adenomatoid aspect of the lesion, the lack of bronchial structures as well as the regular distribution of the hilum vessels orientated towards the diagnosis of CCAML type III. Clinical experience shows that CCAML is unilateral in 98% of cases, with involvement of only one lobe in 95% ([18]). High survival rates without sequelas is reported after surgical treatment of the newborn ([15, 18–20]). Therefore a favorable outcome might reasonably be proposed to the parents, at least in cases of limited extension with no other associated anomalies.

BIBLIOGRAPHY

1) Rempen A., Feige A., Wunsch P.: *J. Clin. Ultrasound, 15*, 3, 1987.
2) Pezzuti R. T., Isler R. J.: *J. Clin. Ultrasound, 11*, 342, 1983.
3) Diwan R. V., Brennan J. N., Philipson E. H., Jain S., Bellon E. M.: *J. Clin. Ultrasound, 11*, 218, 1983.
4) Petit P., Bossens M., Thomas D., Moerman Ph., Fryns J. P., van der Berghe H.: *Clin. Genet., 32*, 172, 1987.
5) Clark S. L., Vitale D. J., Minton S. D., Stoddard R. A., Sabey P. L.: *Am. J. Obstet. Gynecol., 157*, 294, 1987.
6) Stocker J., Madewell J. E., Drake R. M.: *Hum. Pathol., 8*, 155, 1977.
7) Bale P. M.: *A.J.C.P., 71*, 411, 1979.
8) Madewell M. J., Stocker J. T., Korsower J. M.: *Am. J. Roentgenol. Radium Ther. Nucl. Med., 124*, 436, 1975.
9) Mayden K. L., Tortora M., Chervenak F. A., Hobbins J. C.: *Am. J. Obst. Gyn., 148*, 349, 1984.
10) Glaves J., Baker J.: *Br. J. Obst. Gyn., 90*, 1065, 1983.
11) Graham D., Winn K., Dex, Sanders R. C.: *J. Ultrasound Med., 1*, 9, 1982.
12) Carles D., Serville F., Mainguene M., Glycos E., Herfaut G., Naya L.: *J. Genet. Hum., 34*, 339, 1986.
13) Ostor A. G., Fortune D. W.: *A.J.C.P., 70*, 595, 1978.
14) Morcos S. F., Lobb M. O.: *Br. J. Obst. Gyn., 93*, 1002, 1986.
16) Aslam P. A., Korones S. E., Richardson R. L., Pace J. W.: *J.A.M.A., 212*, 622, 1970.
17) Asher J. B., Sabbagha R. E., Tamura R. K., Luck S., Gerbie A. B.: *Am. J. Obst. Gyn., 151*, 97, 1985.
18) Nicolaides K. H., Blott M., Greenough A.: *Lancet*, I, 618, 1987.
19) Stocker J. T.: " Pulmonary pathology ". In: D. H. Dail, S. P. Hammar (eds.), *Congenital and developmental diseases*, Spriger Verlag, New York, Inc., 1988, p. 41.
20) Calisti A., Manzoni C., Pintus C., Perrelli L.: *Eur. J. Obst. Gyn. Repr. Biol., 22*, 61, 1986.
21) Stocker J. T., Kagan-Hallet K.: *A.J.C.P., 72*, 917, 1979.