

Congenital Cystic Adenomatoid Malformation of the Lung diagnosed prenatally in the 33rd week of gestation in woman with gestational diabetes mellitus – a case study

Torbielowato-gruczolakowata dysplazja płucna płodu rozpoznana w 33 tygodniu ciąży u kobiety choruącej na cukrzycę ciążową – analiza przypadku

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Abstract

We report on a case of 33 years old multipara with a congenital cystic adenomatoid malformation of the lung (CCAM) diagnosed in a fetus at a gestational age of 33 weeks. We discuss pregnancy course, imaging characteristics and short-term neonatal outcome.

Key words: **congenital abnormalities / congenital cystic adenomatoid malformation lung / fetal ultrasonography / gestational diabetes /**

Streszczenie

W niniejszym artykule przedstawiamy analizę przypadku torbielowato-gruczolakowatej dysplazji płucnej stwierdzonej w badaniu ultrasonograficznym płodu w 33 tygodniu ciąży u 33-letniej wieloródki, przyjętej celem dalszego leczenia z powodu świeżo wykrytej cukrzycy ciążowej.

Słowa kluczowe: **dysplazja płucna płodu / badanie ultrasonograficzne płodu /
/ cukrzyca ciążowa / ciąża / płód /**

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Introduction

Congenital cystic adenomatoid malformation (CCAM) is a rare abnormality, developing as a result of a maldevelopment of foetal bronchopulmonary system manifesting as a cystic intrapulmonary mass [1]. CCAM is suggested to develop as a hamartomatous lesion combining atresia of bronchial tree with an abnormal growth of alveolar tissue. Most recent studies attribute it to a deregulated growth of mesenchyma and epithelium with an abnormally reduced apoptosis [2]. Data from animal models and in vitro studies also suggest a role of fibroblast growth factor-10 overexpression and underexpression of fatty acid binding protein-7 [3, 4].

First described in 1949 and usually seen in children with recurrent respiratory infections or as an accidental finding in chest radiograph in adults, nowadays it is seen more frequently in antenatal life, due to a progress in imaging techniques and improved protocols of routine ultrasound surveillance of fetal development. Despite an improvement in antenatal diagnostics, its prevalence is still difficult to assess and was estimated to be between 1/25 000 to 1/35 000 in a population of antenatally screened individuals [5, 6]. However, this number may be biased because of a selective pregnancy termination. A more recent study from UK reported on the prevalence of 9.0/100 000 total births, up to 13.6 per 100 000 total births if also changes diagnosed prenatally and regressed upon term were included [1]. Also a prognosis is variable and seems to be associated with a type of malformation seen in ultrasound, mainly its size [7, 8, 9, 10]. The most commonly used classification systems were developed by Stocker (pathological classification used for a final postoperative diagnosis) and Adzick (used for antenatal assessment) [8, 10]. The strongest risk factor for an unfavourable prognosis for foetus included foetal lung hypoplasia, polyhydramnios, mediastinal shift, cardiovascular compromise and particularly foetal hydrops developing as a result of vena cava inferior occlusion [9]. In recent retrospective analyses, authors report only a limited association between foetal characteristics and final outcome and currently only foetal hydrops remains an independent risk factor for a poor perinatal outcome [9, 11]. To enhance a prognostic value of prenatal sonography, Crombleholme et al developed a CCAM volume ratio (CMV) based on the elliptical volume of the lesion divided by head circumference for normalization for gestational age [12]. The value below 1.6 was associated with a good survival rate, however, CMV is useful for solid masses [13]. A spontaneous regression of cystic lesions on ultrasound was also described, however, in recent studies abnormal postnatal chest CT scans were found also in infants free from pulmonary lesions in prenatal sonography at term and CT technique proved to be more sensitive than chest radiography [8, 9, 13, 14]. Associated fetal malformations were reported in up to 15% of cases [15].

Therapeutic options include the whole variety of protocols [13]. For asymptomatic pulmonary lesions with no signs of foetal distress, an expectant approach with ultrasonographic surveillance and qualification for a postnatal surgical therapy seems to be the best option [13, 16, 17]. In hydropic foetuses, in utero therapy: chest puncture and drainage of a dominant cyst as a temporary solution, thoracoamniotic shunting or resection of the involved lobe in open foetal surgery in the most severe cases is now a feasible option [8, 18]. However, there also some data on effectiveness of the maternal betamethasone administration in reduction of foetal

hydrops [19, 20, 21]. A never in-utero technique employed in large microcystic CCAM is percutaneous laser ablation that needs, however, further study to be considered a safe and effective method [11]. The recent study showed also that pulmonary mass resection during the EXIT (ex-utero intrapartum therapy) procedure may be a promising option for foetuses with a significant mediastinal shift and likely to develop postpartum oxygenation problems [8, 22].

Case study

A 33-years old multipara was referred to our Department in 33rd week of gestation for further treatment because of gestational diabetes mellitus (GDM) diagnosed following an abnormal result of oral glucose tolerance test (75g OGTT) performed at 29 weeks.

The patient delivered three times vaginally at term, with a negative history of any gestational or intrapartum complications. She was not screened for GDM in previous pregnancies, however, a birth weight of her largest offspring was 4300g. All her children were alive and developing properly. The patient did not report on any chronic disorders or treatment necessary as well as any major surgery in her own history. Also her family history was negative. During this pregnancy, the patient was covered with a routine antenatal care. The pregnancy was not planned and she started foliate supplementation after her first antenatal visit at 8 weeks. At 20 weeks, she reported having premature contractions and being given oral tocolytics (beta-mimetics, magnesium preparations, Drotaverine). At 30 weeks, she developed an asymptomatic bacteriuria treated with herbal preparations and upper respiratory tract infection treated with Paracetamol. No data on any previous ultrasound scanning was available.

The reason for hospitalization in the tertiary referral centre was an abnormal result of 75 g oral glucose tolerance test – 8.6 mmol/dL two hours after loading. During her first visit in the Department, the patient had her metabolic control checked and participated in a training on blood glucose self-control, diet and lifestyle. Laboratory tests revealed HbA1c 4.9%, average daily blood glucose 4.4 mmol/dL and no abnormalities in routine blood and urine analysis.

As a part of a detailed check-up, the patient also had a transabdominal ultrasound examination for foetal wellbeing assessment that revealed cystic lesions of a diameter between 5 and 23 mm within a left lung, normal right lung and slightly dilated pulmonary veins. (Figure 1).

We did not find any other abnormalities. All foetal parameters corresponded to a gestational age, estimated foetal weight was ca 2300g and amount of amniotic fluid was normal. Following the diagnosis of foetal malformation, our patient was also offered a session with a psychologist. Having completed all diagnostic and therapeutic procedures, the patient was discharged home with recommendations concerning diet, blood glucose self-monitoring and foetal wellbeing self-control using a “count-to-ten” method and a non-stress test twice a week. Another appointment in our Outpatient Department was scheduled within two weeks, mainly for checking metabolic control, general patients’ wellbeing and pregnancy progress.

The next hospitalization was scheduled for the 37th week of gestation. The patient did not report on any complains. Another check-up of metabolic status confirmed proper metabolic control:

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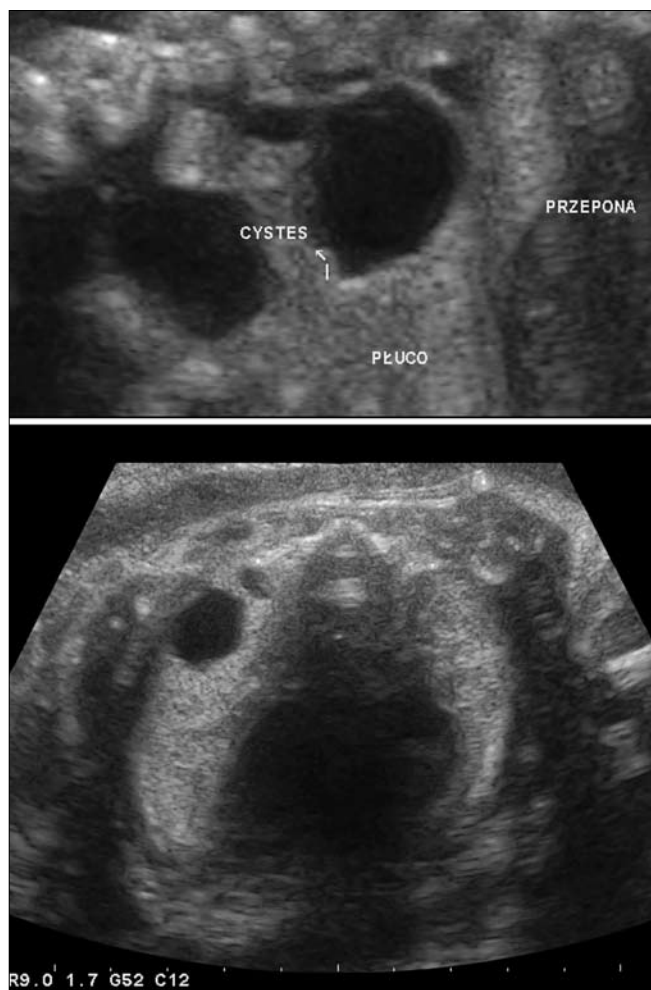


Figure 1. Ultrasound examination performed in the 33rd week of gestation.

HbA1c level was 4.7%, average daily glycaemia was 4.6 mmol/dL and routine blood and urine analysis revealed no abnormalities. Serial sonography confirmed presence of cystic lesions within a left lung with a mediastinal shift, no symptoms of foetal cardiac failure or lung hypoplasia and normal amount of amniotic fluid. (Figure 2).

We asked for a consultation of a paediatric surgeon and, having discussed possible options, the patient was offered a normal vaginal delivery at a term that she accepted. Because of a lack of any symptoms of labour, she was discharged home again.

The next hospitalisation was scheduled at 38 weeks. After six days of monitoring and spontaneous onset of labour, the patient delivered vaginally a daughter weighting 3410g, Apgar score – 9 points. The neonate was transferred to a Neonatology Department for further diagnostic. The chest radiography performed in the first day of the life confirmed lung abnormalities and revealed minor inflammatory changes, therefore an antibiotic therapy was instituted, resulting in resolution of inflammation. A chest CT was also performed, giving a detailed description of cystic lesions within a left lung. It revealed two cysts within a left superior lobe (25x18mm and 13x18mm) together with couple of smaller lesions, probably protruding from a left inferior lobe, and ventral displacement of vessels and bronchi serving the superior lobe.



Figure 2. Ultrasound examination performed in the 37th week of gestation.

It also found two cysts (24x17mm and 10x8mm) within the left inferior lobe. (Figure 3).

No pleural effusion was found in CT scan. In the 6th day of life, another consultation of a paediatric surgeon was obtained and a surgical removal of changed tissue in later life was offered. The child was discharged home in a good health status in the 8th day of life.

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Figure 3. CT image obtained after birth.

Discussion

According to commonly acknowledged recommendations, each pregnant woman should have a detailed ultrasound examination focused on foetal anatomy done at least twice during pregnancy (between 11-14 weeks and 18-22 weeks). Unfortunately, in our patient we had no data on any previous sonography, therefore we were unable to assess a progress of the malformation and a gestational age when it occurred. Data from literature show that usual gestational age when CCAM is diagnosed is late second or early third trimester that may be mainly due to a gestational age when prenatal scanning is performed [9, 11, 15, 23].

Maximum changes' size was reported by the most of authors in the early third trimester (between 25 and 28 weeks) [9, 13, 23]. In available literature, we found no data on cases diagnosed in the first trimester. During the first hospitalization we noted isolated changes within a single lung, with no other symptoms of foetal distress, thus we opted for an expectant management and a close surveillance. During the follow-up visits in term pregnancy, we noted neither changes in pulmonary cysts' size, nor development of any symptoms of foetal status deterioration. The minor mediastinal shift noted in the 37th week of gestation had no impact on foetal wellbeing. Considering classification, our case would correspond to a macrocystic type according to Adzick, without any associated foetal characteristics increasing a risk for an unfavourable perinatal outcome [8]. Typically, CCAM is found in a single pulmonary lobe only. In our case, a final postnatal CT confirmed cystic changes both in the left upper and lower pulmonary lobe and multilobar cases are also reported in the literature [11].

There is no data on any association between maternal conditions and CCAM. Maternal gestational diabetes, usually developing in the second half of gestation is not considered as a risk factor for foetal malformations. However, more recent studies report on an increased prevalence of foetal abnormalities in a population of women with GDM. This may be attributed to concomitant maternal conditions (particularly, hyperinsulinemia characteristic for obesity and metabolic syndrome is discussed as a teratogenic factor) or undiagnosed, subclinical hyperglycaemia in early pregnancy. As the lung development occurs during the almost whole gestation and variety of growth factors involved in CCAM development was described, maternal hyperglycaemia in the second and third trimester might be of some importance, particularly due to growth stimulating action of foetal hyperinsulinemia induced by increased levels of maternal blood glucose [8, 24, 25]. However, no data from literature supports such an association.

Recently, a large number of case-series or retrospective analyses from the most experienced centres dealing with CCAM was reported, adding to our knowledge on this malformation. Studies demonstrate a decline both in associated foetal anomalies, prevalence of hydrops and in mortality rates, however, some risk for unfavourable perinatal outcome is still present [1, 8, 11, 23, 26].

Recent data show unequivocally that isolated CCAM without any symptoms of foetal deterioration is associated with a good prognosis and overall mortality for all cases detected antenatally is less than 5% [8, 27, 28]. However, a close surveillance and frequent foetal sonography to monitor changes in pulmonary mass volume and foetal hemodynamic function together with careful assessment and follow-up in postnatal life is still necessary.

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