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X-RAY DIAGNOSIS OF LUNG HYPOPLASIA

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ABSTRACT

Pulmonary hypoplasia is a rare form of congenital disorder that leads to the underdevelopment of structural elements of the lungs. Although rare, it is associated with significant neonatal morbidity and mortality. Congenital lung abnormalities are frequently discovered in the early life following routine radiographic imaging and investigations. We report the case of a baby, at the age of one day. He was transferred to the NICU (Neonatal Intensive Care Unit, Tbilisi) with acute respiratory failure. This case report aims to aid future early detection to achieve better diagnostic outcomes.

Disturbance of the normal anatomical development of the lung during the embryonic formation of the broncho-pulmonary structures is possible due to a violation of their functional state and/or complete loss [1]. Such changes develop as a result of the influence of endogenous or exogenous factors. In the formation of the type of anomaly, not only teratogenic factors are important, but also the period of pregnancy, when these factors affected the fetus [2]. If the exposure to teratogenic factors occurs during the first 3-4 weeks of pregnancy, when the trachea and main bronchi are formed, it is possible to damage these structures of the lung with the formation of a developmental malformation - lung agenesis, aplasia. Pulmonary agenesis - absence of lung and main bronchus. In case of lung aplasia, only a rudimentary bronchus is developed, the lung tissue is underdeveloped.

Exposure to teratogenic factors during the 6-10th week of pregnancy leads to disruption of the development of segmental and subsegmental bronchi - lung hypoplasia develops. Hypoplasia of the lung is a malformation in which the main and lobular bronchus develop, while the structural elements of the lung - lung parenchyma, bronchi, blood vessels - are

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KEYWORDS: congenital lung abnormalities; lung hypoplasia; pulmonary hypoplasia.

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underdeveloped. Hypoplasia can be unilateral or bilateral. Visible visual changes characteristic of unilateral hypoplasia are: asymmetry of the chest, reduction in the size of the affected side, narrowing of the intercostal space, deformation of the thoracic part of the spine - scoliosis on the healthy side. In case of bilateral hypoplasia, chest asymmetry is less pronounced.

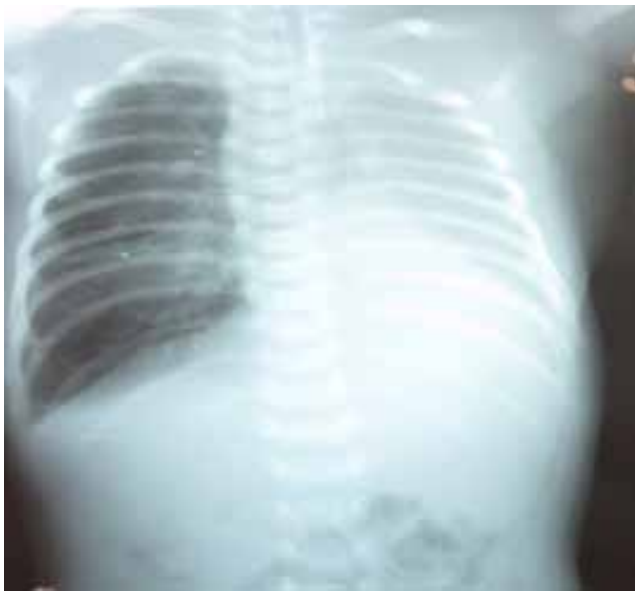
There are two forms of hypoplasia: simple and cystic. In the case of cystic hypoplasia, the respiratory structures of the lung or the damaged lobe are underdeveloped, the corresponding bronchi with their cystic degeneration, agenesis of the alveoli and hypoplasia of the pulmonary vessels are revealed. In the case of simple hypoplasia, the field, lobe or segment of the lung is reduced due to the underdevelopment of the bronchus or parenchyma, and the pulmonary artery is also underdeveloped. This is a lung that does not have enough lung tissue and blood circulation for gas exchange. Respiratory diseases are common in the anamnesis of both cases.

The necessary factors for the normal functioning of the fetal lung are: normal volume of the chest cavity, normal amount of amniotic fluid, (lack of amniotic fluid is the most frequent cause of pathological development of the fetal lung) [5], normal amount of fetal lung fluid, normal fetal respiratory movements. Therefore, the causes of lung hypoplasia are: 1. Deformed and small chest cavity (in case of congenital diaphragmatic hernia, chest cavity malformations). 2. Imperfect fetal respiratory movements. The causes of decreased fetal respiratory movements are neuromuscular diseases, diseases of the central nervous system or tumor formations. 3. Inadequate volume of amniotic fluid (oligohydramnios therefore causes obstructive or other diseases of the urinary system with renal agenesis) [3, 4, 7]. 4. Inadequate volume and pressure of fluid in the fetal lung. The underlying pathophysiological processes that cause fluid pressure disturbances in the fetal lung are unclear. In addition to these causes, pulmonary hypoplasia can be idiopathic or associated with congenital anomalies and syndromes, eg: Multiple pterygium syndrome (fertal akinesia-hypokinesia episodes, autosomal-recessive), Scimitar syndrome (6) da Trisomy 21, presence of excess fluid in the pleural cavity for a long period of time, achondroplasia and neuromuscular diseases. In some cases, it is difficult to make a diagnosis.

Radiologically: the hypoplastic lung is reduced in size, its pneumatization is reduced, the vascular picture is poor, the diaphragmatic arch is high on the side of the injury. There is hypertrophy of the opposite lung, increased pneumatization, mediastinal organs and the lung are misplaced on the side of the lesion. The bronchographic picture is visible - the bronchial tree is impoverished, the lumen of the bronchus is narrowed, the peripheral branches are sharply narrowed and underdeveloped.

Case description:

The patient, G. N. male, at the age of one day, he was transferred to the NICU (Neonatal Intensive Care Unit) with acute respiratory failure. A newborn from the first pregnancy and the first delivery, with a heavy obstetric anamnesis. (The first sterility in 5 years, myopia, hectic fever on the 37th week). The child was born with a gestational age of 38 weeks, from a planned caesarean section. Indications for caesarean delivery: myopia, meconial amniotic fluid. With a mass of 2800 gr. It was evalu-



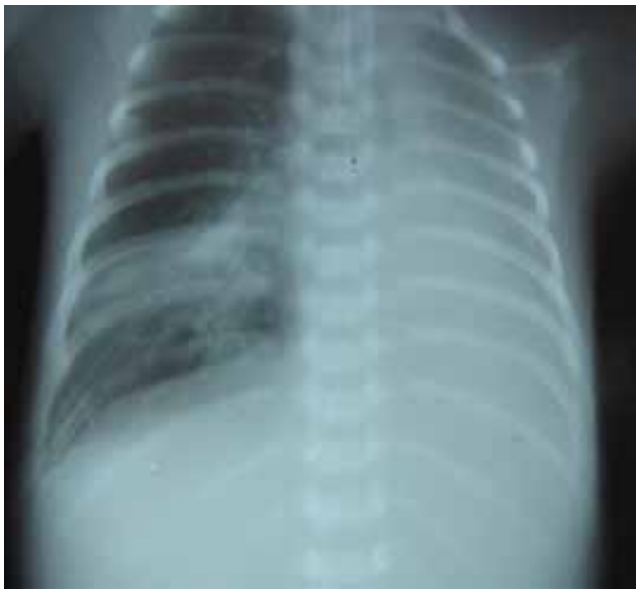


Fig. 1, 2 *X-ray of the chest. Hyperneumatization of the right lung. The left lung field is reduced in size, pneumatization is visible only in the area of the upper lobe. Mediastinal structures are shifted to the left. High position of the diaphragmatic arch. Pneumonia of the lower lobe of the right lung.*

ated with 8/9 points on the Abgar scale, respiratory failure was manifested 3 hours after birth: wheezing, retraction, tachypnea, wet wheezing on the left by auscultation, as well as sharply weakened breathing. On the X-ray of the chest, hypertrophy of the right lung, hyperpneumatization, the left lung field is reduced in size, pneumatization is visible only in the area of the upper lobe. The mentioned changes were assessed as atelectasis, although the presence of a malformation of the left lung was suspected (Figure 1). In order to clarify the diagnosis, the patient underwent a CT scan.

Multilayer CT study conclusion:

Mediastinal structures are shifted to the left, trachea, right main bronchus, right main lobar and the proximal part of the narrowed lumen of the left lower lobar bronchus 3 mm long, not visible distally. MIR, MPR, VRT reconstructions were performed: The lower lobe of the left lung is shaded, areas of air density are not revealed, pneumatization is reduced on the projection of the upper lobe due to peribronchovasal in-

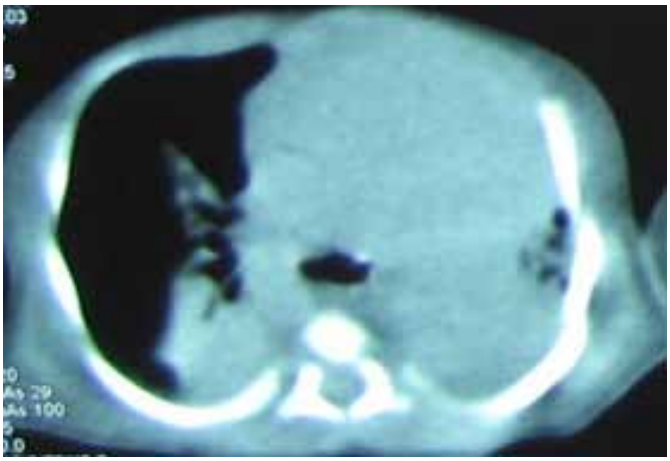


Fig. 3*. Axial CT image*

filtration, against the background of which the lumens of the bronchi are visible. Chest lymph nodes without hyperplasia, the mammary gland corresponds to the age norm (Fig. 3).

In complete blood count: erythrocytes.-4.2; leukocytes.-21. Bands-20. Metamyelocyte-5, mmyelocyte-2. Promyelocyte-1, HT-38 %.

Blood biochemical parameters – blood glucose 71 mg/dl; CRP-24 mg/l; CA – 6.0 mg/dl; total protein - 52 g/l, creatinine -

2.22 mg/dl; Residual nitrogen – 54, 8 mml. Blood PH – 6.9; PCO-2 – 82; PO-2 - 19; BE - -13; HCO-3 - 18.6; NA-138; K – 6.75. Ca – 1.28.

Neurosonoscopy - diffuse acute hypoxia.

Echocardiography: the right atrium and ventricle are dilated, open oval (7 mm) and bottal duct (4 mm).

Bronchoscopy was performed on the patient: the lumen of the main bronchus on the left is clogged with thick fibrinous secretion; the walls at the entrance of the main bronchus are covered with fibrin plaques. A bacterial study of the taken material (fibrinous secretion) was done. A gram stick was taken out.

Based on the research, the final diagnosis was made: hypoplasia of the left lung. Antibacterial treatment was prescribed according to the sensitivity of the microbe. Parenteral nutrition was also prescribed.

Despite the treatment, the patient's condition remained serious. The inflammatory process in the right lung was added to the mentioned changes, due to which he was taken into the intubation.

Under the conditions of the development of modern medical technologies, early diagnosis of the fetus during pregnancy becomes possible. Ultrasonography allows us to measure the fetal lung field, head circumference and evaluate the ratio of the obtained results. A ratio <1 is associated with a high percentage of perinatal deaths.

With the help of ultrasonography, it is possible to predetermine severe hypoplasia of the lung.

The prognosis depends, first off, on the vital volume of the newborn's lung. It is important to determine the reasons that caused the violation of the normal anatomical development of the lung.

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РЕЗЮМЕ

Рентгенодиагностика гипоплазии лёгких

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Гипоплазия легких - редкая форма врожденного заболевания, приводящая к недоразвитию структурных элементов легких. Врожденные аномалии легких часто обнаруживаются в раннем возрасте после обычной рентгенографии и обследований. Эта редко встречающаяся аномалия часто становится причиной смерти. Мы сообщаем о случае с младенцем в возрасте одного дня. Он был переведен в отделение интенсивной терапии новорожденных в Тбилиси с острой дыхательной недостаточностью. Этот отчет о клиническом случае призван помочь в будущем в раннем выявлении для достижения лучших результатов диагностики.

Ключевые слова: врожденные аномалии; врожденные аномалии легких; гипоплазия легких; легочная гипоплазия.

რეზიუმე

ფილტვის ჰიპოპლაზიის რენტგენოლოგიური დიაგნოსტიკა

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ფილტვის ჰიპოპლაზია ფილტვის სტრუქტურული ერთეულების განვითარების დარღვევის თანდაყოლილი, იშვიათი ფორმაა. მიუხედავად იმისა, რომ იგი ვითარდება იშვიათად, დაკავშირებულია ახალშობილთა მნიშვნელოვან პათოლოგიებთან და ლეტალურ გამოსავალთან. ფილტვის თანდაყოლილი ანომალიები ხშირად აღმოჩნდება სიცოცხლის ადრეულ ეტაპზე რუტინული რადიოგრაფიული სურათებისა და კვლევების შედეგად. ჩვენ განვიხილავთ ერთი დღის ახალშობილის შემთხვევას, რომელიც გადაყვანილი იქნა ახალშობილთა რეანიმაციულ განყოფილებაში მწვავე რესპირატორული უკმარისობით. თავდაპირველად რენტგენოლოგიურად დაისვა მარცხენა ფილტვის ატელექტაზის დიაგნოზი, თუმცა ეჭვი მიტანილ იქნა განვითარების სხვა მანკზეც, რის გამოც გაკეთდა კომპიუტერული ტომოგრაფია და დაისვა ფილტვის ჰიპოპლაზიის დიაგნოზი. ჩვენი მიზანია მოხდეს მსგავსი დიაგნოზის მქონე პაციენტების ადრეული დიაგნოსტიკა და შესაბამისად ჩატარდეს დროული და ადეკვატური მკურნალობა.

საკვანძო სიტყვები: ფილტვების თანდაყოლილი ანომალია, თანდაყოლილი ანომალია, ფილტვების ჰიპოპლაზია.