Spontaneous Pleural Effusion in a Human Fetus

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ABSTRACT Left sided pleural effusion was found in a human fetus spontaneously aborted at 20 weeks postmenstrual. Pulmonary hypoplasia associated with the effusion suggested that the fluid had been present for some time before delivery. Absence of other anomalies supports the view that the effusion was due to maldevelopment of the thoracic lymph channels.

Spontaneous pleural effusions are unusual in the newborn period. They occur occasionally in infants with hydrops fetalis, Turner syndrome, or pneumonia (Chernick and Reed, '70). Chylothorax is the most common form of pleural effusion found in the first few days of life. The following instance, discovered on routine autopsy by the University of Michigan Teratology Unit as part of a program of surveillance of human abortuses, is believed to be the first report of a fetus with a pleural effusion.

CASE REPORT

This male fetus was delivered spontaneously at 20 weeks postmenstrual by a 25-year-old gravida 4, para 1, abortus 2. The mother had received no prenatal care but reported no problems prior to the onset of labor, which occurred shortly before delivery. At birth the heartbeat was slow for a few minutes but no attempts were made to breathe. The following measurements were obtained: weight, 361 g; crown-heel length, 270 mm; crown-rump length, 188 mm; foot length, 37 mm; head circumference, 178 mm; and thorax circumference, 144 mm. The external appearance was normal.

A massive pleural effusion was found in the left hemithorax (fig. 1). Twelve milliliters of clear yellow fluid were aspirated from the left chest, while the right hemithorax contained 0.2 ml. The mediastinum, thymus, and heart were shifted to the right. The left lung appeared markedly hypoplastic (fig. 2) but was normally divided into two lobes. The right lung was morphologically normal. Total lung weight was 7.11 g (left 2.41 g, right 4.70 g). Expected lung weight was 9.94 g (Tanimura et al., '71).

No defects of the heart or great vessels were found. Despite careful dissection the thoracic duct could not be identified. The thymus and thyroid were normal in size and configuration. No defects of the trachea, esophagus, diaphragms, abdominal viscera, or brain were found. Unfortunately the pleural fluid was inadvertently lost before its composition could be studied. Histological examination of the lungs showed no abnormalities and no differences between the right and left sides.

DISCUSSION

A number of reports of pleural effusion recognized at or shortly after birth have appeared in the literature and have been reviewed by Yancy and Spock ('67) and Kundert and Willich ('69). Most cases of congenital pleural effusion are presumed to be forms of chylothorax. In the newborn the fluid is clear and yellow, becoming chylous only after ingestion of milk. Willich and Kundert ('70) classified the causes of chylothorax as trauma, acquired disease, and congenital anomalies. The last group was subclassified into: (1) aplasia or hypoplasia of the thoracic duct, (2) defect in the wall of the thoracic duct, (3) cyst or dilatation of the thoracic duct, (4) congenital fistula between the thoracic duct and the pleural cavity, (5) annular thymus, and (6) congenital anomalies of the heart or great vessels.

During the period of organogenesis bilateral thoracic channels develop, each attached to the jugular lymph sac in the

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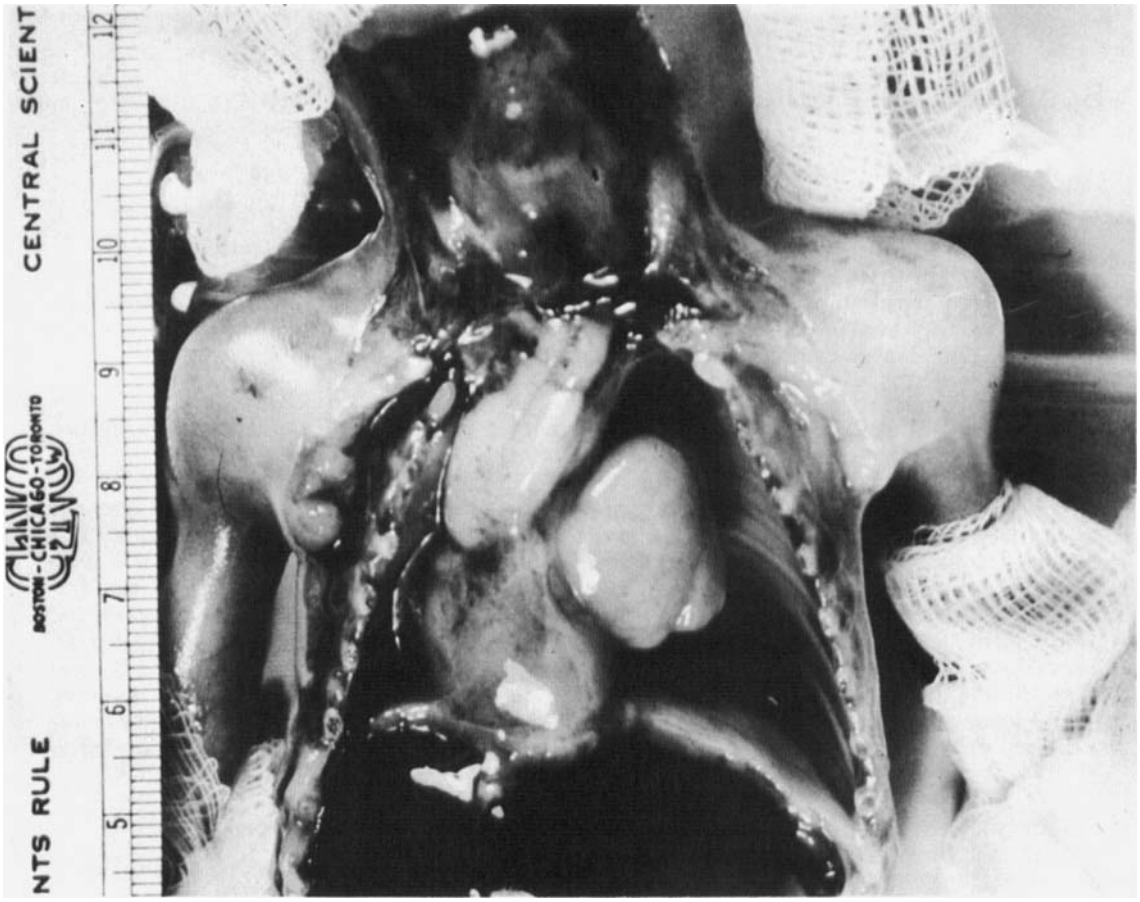

Fig. 1 Thorax with sternum and anterior ribs removed. Note the space the effusion in the left pleural cavity occupied and the shift of the mediastinum to the right.

neck. The upper third of the right channel and the lower two thirds of the left become obliterated, and the remaining channels form the permanent thoracic duct which is recognizable at about the tenth postmenstrual week (Sabin, '09). "The multiplicity of eventual anatomical arrangements of the main duct system attests to the haphazard connections of the tiny vessels comprising the lymphatic system. It is easy to understand why congenital anomalies can occur in the couplings of such a random network" (Randolph and Gross, '57, p. 406).

Autopsy verification of thoracic-duct anomalies in newborn infants is scanty. In none of the seven autopsied cases reviewed by Yancy and Spock ('67) was the thoracic duct found to be damaged or anomalous. Gates et al. ('72) demonstrated thoracic-duct leakage using ^{198}Au lymphangiography in a term infant who had immediate postnatal onset of symptoms from pleural effusion.

In chylothorax of various etiologies there is often a latent period between ductal rupture and the onset of symptoms. The most reasonable explanation for the latent period is that it is the time needed for the accumulated lymph in the mediastinum to break through the pleura. A number of newborns have been reported to have developed respiratory symptoms at birth (Randolph and Gross, '57; Yancy and Spock, '67; Kundert and Willich, '69). The absence of a latent period in these infants suggests the prenatal existence of the pleural effusion. The possibility of a pleu-

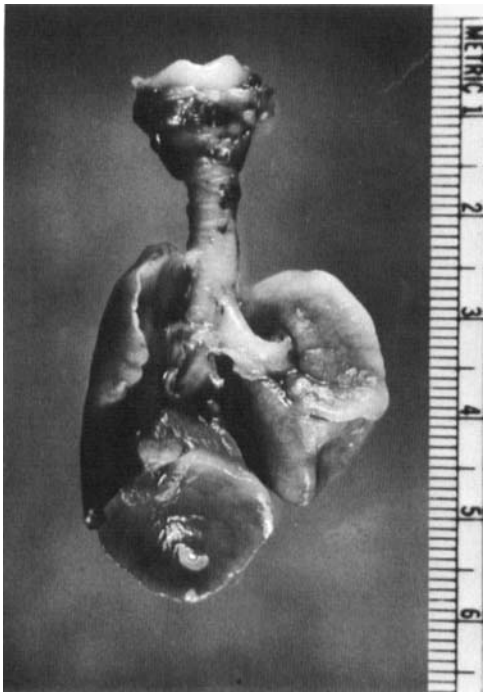

Fig. 2 Anterior view of the trachea and lungs showing the marked left pulmonary hypoplasia.

ral effusion existing well before birth is confirmed by our case.

The occurrence reported in this paper could not heve arisen from acquired disease or trauma. The presence of pulmonary hypoplasia on the affected side indicates that the effusion existed for some time prior to delivery, at 20 weeks' gestation. Malformation or fistula of the thoracic duct could not be established as the cause of the effusion since the duct could not be identified. However, the absence of other defects known to be associated with pleural effusion supports the concept that maldevelopment of the lymphatics was the etiology of the effusion in this case.

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