PULMONARY HYALINE MEMBRANES IN THE NEWBORN

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In some infants dying within the first week of life, microscopical studies of the lung tissue show homogeneous, hyaline membranes lining the alveolar ducts and proximal alveoli. A common associated finding is atelectasis of the peripheral lung tissue. The hyaline membranes are seen more frequently in premature than in full-term infants, and only in infants who have breathed.

Infants with hyaline membranes in most instances present a typical sequela of clinical events. During the first few hours after birth there may be no pathological physical findings. Later in the course of the first day, however, cyanosis appears. At the same time the infant's respirations are heavy and frequent and apparently ineffective as they fail to improve the colour. In our experience, a diminution in the intensity of the breath sounds has been a frequent observation. A marked disproportion between the exaggerated respirations and the diminished breath sounds may thus be an outstanding feature.

This syndrome has recently attracted great attention and has often been discussed in the current paediatric literature (Ahvenainen, 1948; Blystad, Landing and Smith, 1951; Marstrander, 1953; Miller, 1951). Several theories of the pathogenesis of this syndrome have been advanced, but a definite cause has not been demonstrated.

Material

The following analysis comprises 56 cases of hyaline membranes, detected in 216 consecutive necropsies. These were all infants who died during the first week of life, and were examined at The Institute of Pathological Anatomy, University of Oslo, during the six-year period from 1948 to 1953. In every case the microscopical slides, usually two slides from each lung, were re-examined by us.

Fig. 1 shows the distribution of all cases of hyaline membranes in relation to birth weight and age at death. It may be seen that 70% of these infants died within the first 24 hours of life. Further, 70% of all the infants with hyaline membranes were premature.

Fig. 2 shows all premature infants who died within the first week of life, and the proportion with hyaline membranes (black columns). It will be seen that roughly half of the premature infants who died within the first three days had hyaline membranes in the lungs.

At necropsy, 23 of the 56 infants with hyaline membranes presented other pathological conditions considered capable of explaining death. These were pneumonia, malformations, erythroblastosis, or intracranial haemorrhage, all of severe grade, with a distribution as shown in Fig. 3, and were found (1) in 10 of 38 infants who died within the first 24 hours of life (26%); (2) in 13 of 18 infants who died during the second to fifth day of life (72%).

Slight intracranial or pulmonary haemorrhage is considered asphyxial, and has therefore not been included.
Discussion

The frequency and distribution of hyaline membranes, as shown in Figs. 1 and 2, accord with observations reported by other authors. Arey (1949), Blystad et al. (1951) and Potter (1952) thus found it more frequently in premature than in full-term infants. Potter (1952) found hyaline-like membranes as the only pathological change in 40% of all infants weighing from 1,000 to 2,500 g. in a 10-year period. Blystad et al. (1951) found hyaline membranes in roughly half of all premature infants studied.

As to the actual cause of death in cases of hyaline membranes, Potter (1953) states that the respiratory difficulty frequently causes death within 24 hours, and she claims that 'in infants surviving more than 48 hours after birth, we have never found an uncomplicated hyaline membrane'.

This is in good accordance with our findings. Our series, although small, indicates that the first day of life is especially critical in infants with hyaline membranes. Twenty-eight infants who died within the first day presented no other major pathological condition, while only five infants who died after the first day showed uncomplicated hyaline membranes at necropsy. In 10 infants dying within the first day, and in 13 dying within the next four days, death might have been due to other causes than hyaline membranes. Even in these cases, however, hyaline membranes must at least be considered a contributory cause.

Clifford (1953) states that the vast majority of infants with hyaline membranes may recover on or about the fourth day of the disease. Our observations indicate that in suspected cases of hyaline membranes, therapeutic measures should be instituted even in the first hours of life, in order to minimize the risk of a fatal outcome.

Summary

An analysis is given of 56 infants with pulmonary hyaline membranes examined post mortem. The findings indicate that the first day of life is especially critical in infants presenting this syndrome. Most infants with hyaline membranes who died after the first day of life presented severe accompanying lesions at necropsy.

Before death, a marked disproportion between the exaggerated respiratory movements and the diminished breath sounds was found to be an outstanding feature.

References