Problems of the Newborn

Respiratory and Cardiac Emergencies

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Failure of respiration and failure of the circulation are the only situations which can be said to be true neonatal emergencies in the sense that action must be taken in a matter of seconds if life is to be saved. Both may occur in birth asphyxia, a subject already discussed by Professor J. Davies (16 October, p. 164). Nonetheless, in the newborn baby several situations arise in which rapid and appropriate action can save life or prevent serious illness. In the next three articles in this series some of these situations will be discussed, orientated mainly towards problems in the term, rather than the preterm, infant.

Respiratory Problems

Respiratory difficulties usually present because the mother or midwife reports symptoms to the doctor but are occasionally noticed only at a routine examination. The presenting signs are one or more of the following; rapid respirations, difficulty in breathing, cyanosis, grunting, stridor, apnoeic episodes, and only very rarely cough. Inspection of the unclothed child gives one a better indication of the urgency of the situation than such formal procedures as auscultation. One is then immediately aware of the colour of the child, the rapidity of his respiration, the degree of difficulty of breathing as shown by recession or grunting, and of his general condition.

Clearing the airways and giving artificial ventilation will be the obvious action in some serious conditions but more commonly further examination to establish a working diagnosis will be needed. Since the cause of such symptoms may be as diverse as respiratory disease, cardiovascular disease, neurological disease, infection, or metabolic disease, the examination must be thorough—and of the whole baby rather than only of part of him. In all cases of respiratory difficulty in the newborn basic supportive measures are ensuring clear upper airways, giving enough oxygen to combat cyanosis, and keeping the baby warm.

CONGENITAL MALFORMATIONS

Such malformations usually present as respiratory difficulties following on the establishment of respiration at birth or in the succeeding hours. They include choanal atresia, diaphragmatic hernia, Pierre-Robin syndrome, tracheo-oesophageal fistula, mediastinal tumours, tracheal webs, and vascular rings. Most need urgent, usually surgical, treatment. Details of diagnosis and management are discussed elsewhere in this series. As a generalization, it is essential to ensure a clear airway (by endo-

tracheal intubation if necessary) until further procedures can be arranged. In choanal atresia an oral airway will usually suffice and in the Pierre Robin syndrome turning the baby face down is often effective.

ASPIRATION SYNDROMES

Powerful gasping movements occur in an asphyxiated baby in utero and after birth. Fluid and particulate matter may be carried down the bronchial tree, resulting in dyspnoea and occasionally bacterial pneumonia. Since intrauterine asphyxia is associated with the passage of meconium into the amniotic fluid, meconium may thus be aspirated. Sometimes the upper airways are so obstructed with meconium that resuscitation is impossible, but more commonly a serious dyspnoea often with cyanosis persists for 24-48 hours. Localized moist sounds may be heard on auscultation of the lungs. The treatment consists of giving enough oxygen to correct cyanosis, adequate warmth and humidity, and antibiotics because of the possibility of bacterial infection. Spontaneous pneumothorax is a comparatively common complication of such aspiration and should be suspected if there is sudden clinical deterioration (see below).

Aspiration of milk occurring with an apnoeic spell is rarely seen in otherwise well term infants, though it is often encountered in small preterm babies. Should it occur in a term infant pharyngeal suction is usually all that is necessary, but if respirations are not quickly re-established suction under direct vision with a laryngoscope is necessary. One must then consider why an apparently healthy baby had such an episode and re-examine him for unsuspected disease, especially infection.

PNEUMONIA

Whenever a newborn term infant has obvious respiratory difficulty, pneumonia is high on the list of possible causes, unless an obviously non-infective cause can be identified. Pneumonia may also present as a seriously ill baby with apnoeic episodes. Factors which are associated with neonatal pneumonia are aspiration syndromes, prolonged rupture of the membranes, prolonged labour even with intact membranes, and excessive obstetric manipulation. One would expect to find localized fine rales (percussion is not very helpful in the newborn) and signs of systemic infection. Nevertheless, the absence of such signs does not exclude pneumonia, and one may have to act on the symptomatology and the circumstances surrounding the respiratory difficulties. Thus in these circumstances even those of us who decry prophylactic antibiotics will use them, after cultures have been taken. The cultures helpful in identifying the causative organism are those from the nose, throat, and umbilical swab and blood culture. An x-ray film, usually showing a localized but mottled opacity in the lung fields, is also helpful. Until the result of cultures is known, a combination of

antibiotics effective against Gram-positive cocci and Gram-negative bacilli should be given. Such a combination might be cloxacillin with ampicillin or penicillin with canamycin. Though the usual organisms encountered are streptococci, staphylococci, and *Escherichia coli* species, one must be aware that rare but important organisms such as *Listeria monocytogenes*, *Treponema pallidum*, and *Mycobacterium tuberculosis* also cause pneumonia. Viruses obviously may also cause pneumonia and will not be amenable to antibiotics, though the other supportive measures are still useful.

PNEUMOTHORAX

A baby when gasping powerfully may generate negative pressures of 80 mm H₂O—that is, much greater than the pressures used in the artificial ventilation of resuscitation. If at the same time sticky secretions or aspirate are present they may act as a non-return valve in the airways to part of the lung, and a pneumothorax may occur. Thus, though pneumothorax may undoubtedly occur after artificial ventilation with uncontrolled pressures, in the newborn it most commonly occurs *spontaneously* after an episode of aspiration of meconium or other sticky material. Perhaps the most common presentation is in a term baby, or small-for-dates baby, whose birth was associated with meconium-stained liquor and an episode of birth asphyxia.

Pneumothorax should be suspected in any baby with such a history (or with other causes for sticky secretion such as pneumonia, ventilation treatment, or aspiration) who suddenly deteriorates. The deterioration usually takes the form of increased respiratory distress, poor colour, and poor peripheral circulation. Auscultation of the lung fields shows poor or absent breath sounds on one side of the chest with the position of the mediastinum, as identified by where the heart sounds are best heard, displaced to the other side. If the baby's condition is very poor action must be taken on clinical signs alone. When the urgency is less immediate the term baby should be given a high concentration of oxygen to breathe while a chest x-ray film is arranged.

When a *tension* pneumothorax is suspected clinically from the seriousness of the baby's condition, or shown by chest x-ray film, it must be drained at once by inserting a needle, or better still a polyvinyl tube on a needle—for example, Angiocath—into the pleural space, through the 4th intercostal space in the anterior axillary line. After the immediate release of air under pressure, drainage should be allowed to continue by connecting the polyvinyl tube to an underwater seal drain. Occasionally a larger tube will have to be inserted to ensure adequate drainage.

When a pneumothorax, diagnosed clinically or confirmed by x-ray, is small and not under tension, drainage is not usually necessary. High concentrations of inspired oxygen accelerate the rate of reabsorption of a pneumothorax.

HYALINE MEMBRANE DISEASE

Hyaline membrane disease, though the commonest cause of respiratory distress in preterm infants, occurs only very rarely in babies born after 37 completed weeks of gestation, except in infants of diabetic mothers, in whom it is more likely to occur at term. The triad of signs are raised respiratory rate (more than 60 per minute), costal recession, and expiratory grunt, for which no other known cause can be found. A chest x-ray film is essential; it shows a characteristic picture of a generalized mottling of the lung fields and an "air bronchogram," in which the bronchi stand out as translucencies against the collapsed alveoli. Per-

haps more importantly, the chest x-ray film helps exclude other causes of respiratory difficulty in the term baby. Though hyaline membrane disease carries a high mortality in small preterm babies, it usually pursues a mild course of about two days of only moderate respiratory distress in term babies.

Therefore the term baby in whom this diagnosis is suspected should be sent to hospital for x-ray examination and observation but he will probably only need supportive treatment and the prognosis is good.

CONGENITAL LOBAR EMPHYSEMA

This condition, which usually presents after the first few days with increasing respiratory distress, results from a valvular bronchial obstruction to a lobe which becomes distended and leads to mediastinal shift. It thus mimics a pneumothorax but is distinguished by a chest x-ray film. The treatment is, of course, surgical and the baby must be sent to hospital.

NEUROLOGICAL DISORDERS CAUSING RESPIRATORY PROBLEMS

Neurological disorders may cause a spectrum of respiratory problems from apnoea, through shallow inadequate respiration to tachypnoea. Though there may be other obvious signs of neurological problems it is incumbent to exclude a respiratory or cardiological cause for such symptoms, since they may coexist.

Congenital Heart Disease

Congenital heart disease, though it may have many guises, usually presents in the newborn period with tachypnoea and tiring during feeds associated with abnormal clinical signs, such as cyanosis, cardiac murmur, and abnormal or absent pulses. Examination should include auscultation of the heart for murmur, arrhythmias, or gallop rhythm; palpation of the peripheral, including the femoral, pulses; auscultation of the lung fields for fine rales; and palpation for the spleen and liver edge. A rapidly enlarging liver is the most definite sign of right heart failure in babies.

From the clinical findings, together with an electrocardiogram and chest x-ray film, a presumptive diagnosis can usually be made. If a newborn baby has cyanotic heart disease the lesion is frequently lethal but even if he shows no distress he should be investigated at once since a small proportion will have a condition amenable to surgery or a procedure such as atrial septostomy. If the baby has acyanotic heart disease his further management will depend on the severity of his symptoms and his response to medical treatment. If he has no symptoms, or if his symptoms and heart failure are immediately relieved by medical treatment, investigations such as cardiac catheterization to establish a precise diagnosis are best deferred until after the newborn period. If a baby with acyanotic heart disease fails to respond to, or deteriorates despite medical treatment, a precise diagnosis must be established, by cardiac catheterization if necessary, to consider the possibility of curative or palliative cardiac surgery.

The medical treatment of cardiac failure consists of giving digitalis, diuretics, oxygen, and sometimes sedatives. The baby is best nursed at an inclination, with the head propped up, and it is important to pay attention to nursing temperatures. The cyanotic baby is at risk from hypothermia and needs particularly high environmental temperatures; the acyanotic baby with a large left to right shunt often sweats profusely and needs slightly lower than usual nursing temperatures.