Problems of the Newborn

Immediate Problems at Birth

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Since most difficulties affecting babies at birth are at least statistically predictable, labours in which they are likely to arise should be conducted in a hospital where adequate paediatric services are available. But occasionally emergencies occur in circumstances which could not have been or were not foreseen, and in that case coping with them will devolve on whoever has taken on the responsibility of standing by during the delivery—that is, the midwife and the general practitioner. In this article it is assumed that the midwife will be preoccupied with the routines of delivery and that the family doctor will be present to deal with any emergency that may threaten the wellbeing of either mother or baby.

The common emergencies at birth are the same as those met at other times in life—respiratory failure and shock—and in principle the methods for dealing with them are also the same. Nevertheless, there are aspects of infant anatomy and physiology which call for a rather different approach to that adopted, for instance, in the case of cardiac or respiratory arrest in an adult.

Pathophysiology of Birth Asphyxia

METABOLIC CONSIDERATIONS

Asphyxia is probably an invariable accompaniment of birth, and not surprisingly, therefore, the normal baby is well equipped by nature to withstand it. During the last trimester of pregnancy large stores of available carbohydrate are laid down in the liver, muscle (including the heart), and skin; and as a result the baby with a normal birth weight at term is able to maintain the action of the heart and diaphragm for as long as 20 minutes in the absence of oxygen by reverting to anaerobic glycolysis. Though this involves wasting about nine-tenths of the energy normally to be derived from carbohydrate by aerobic glycolysis, and the development of an acute lactic acidosis, the reserves are usually large enough to ensure that the heart does not fail and the brain is not damaged until the lungs expand and the oxygen supply is renewed. But in the case of small-for-dates babies the reserves may not be sufficient and this feature perhaps accounts for their high still-birth rate.

RESPIRATION

Before birth the fetal lungs are expanded with a fluid which flows outwards into the amniotic sac and is not appreciably displaced by the respiratory movements that occur in utero. At birth some of this fluid is squeezed out of the lungs through the trachea in the birth canal, while the rest is absorbed by the

lymphatics once the lungs are partially expanded and perfused. The first cry is probably a reflex response to bombardment of the respiratory centre with impulses originating in the many kinds of sensory stimulation to which the baby is subjected during and at birth. Normally crying is sufficient to expand the lungs within a minute or so and thereafter the baby should be able to maintain normal tensions of gases in the blood and an adequate uptake of oxygen.

CIRCULATORY ADJUSTMENTS

Expansion of the lungs and the consequent increase in oxygen tension and decrease in CO₂ tension within the alveoli cause the pulmonary vascular resistance to fall and the blood flow in the lungs to increase. As a result, the foramen ovale and ductus arteriosus close. When the umbilical cord is tied the systemic blood pressure rises and there is probably an increase in cerebral blood flow. The circulation thereafter follows the adult as opposed to the fetal circuit with the pulmonary and systemic circulations in series rather than parallel.

PLACENTAL TRANSFUSION

Much of the 90 ml or so of blood in the placental part of the fetal circulation is transferred to the baby as a result of uterine contractions, suction by the expanding chest, and the action of gravity. The baby thus receives a transfusion which may contribute significantly to his blood volume, oxygen-carrying and acid-buffering capacities, iron stores, and immune globulin levels.

RESPONSE TO ANOXIA

If the baby becomes totally anoxic rather than moderately asphyxiated at birth, this sequence of events is disturbed and a different pattern is seen. Respiratory activity is inhibited; the pulse slows sharply; muscle tone is lost; meconium is voided; while the baby becomes increasingly pale as the blood is diverted from the skin to vital organs. There is no response to stimulation. The placental transfusion may be lost; severe acidemia develops; and the normal circulatory adjustments to birth are inhibited or delayed. In these circumstances the initial apnoea is normally succeeded by deep gasping, which is often sufficient to expand the lungs, revive the baby, and establish normal breathing. Nevertheless, if carbohydrate reserves are exhausted, or the degree of acidemia is profound, the circulation may fail before rhythmic respiration is established—and in this case terminal apnoea supervenes and brain damage begins. The period of primary apnoea that precedes gasping may be prolonged by the action of narcotic drugs given to the mother and transmitted through the placenta. Moreover, the total duration of life may be shortened if, as a result of premature birth,

malnourishment in utero, or episodes of asphyxia in utero, carbohydrate reserves were initially low or were dissipated before birth.

Conclusions

Some babies who do not breathe immediately at birth will recover spontaneously with the onset of gasping. Others may die or suffer brain damage if they are not rapidly resuscitated because at birth they are already past their last gasp or down to their last reserves of energy or buffering power. To some extent the urgency of the situation can be gauged by the following features: the pulse rate, which if well below 100 and falling suggests a need for immediate intervention; the baby's general condition; considerable pallor, absence of muscle tone, and particularly failure to respond to stimulation, which are other worrying signs. The state of nutrition also has an important influence, babies of low birth weight for their gestational age having a worse prognosis. It is very useful, especially if a stop clock or watch is to hand, to record these observations at one-minute intervals after birth using a tape recorder or card, but clearly the decision to intervene needs to be taken early and acted upon at once. The form which this intervention should take is set out below.

Technique of Resuscitation

ARTIFICIAL VENTILATION

The only method likely to be effective in all circumstances is the insertion of an endotracheal tube for artificial inflation and ventilation of the lungs. It is usually a mistake to waste time on other measures such as the injection of respiratory stimulants, or giving oxygen by bag and mask, which in any case do not give the opportunity to inspect and clear the airway.

The technique of intubation is best learned by practice on a stillborn baby. The baby is positioned with his head towards the operator and extended on the flexed neck—the attitude appropriate to smelling a flower. The handle of the laryngoscope is held between the thumb and index finger of the left hand, the other fingers of which are used to push the larynx towards the spine so as to tilt the laryngeal introitus forwards and to occlude the oesophagus. The blade is inserted over the tongue but not over the epiglottis, which will tilt forward when the tongue is depressed and pulled forward, so exposing the introitus. Gentle suction under direct vision and avoiding the cords themselves will usually clear the airway and sometimes stimulate a gasp; and it is then possible to insert a shouldered endotracheal tube under direct vision into the upper trachea taking care not to enter the oesophagus behind or a main bronchus by inserting it too far. In hospital it is usually the custom to inflate the lung with oxygen from a cylinder using a cut-off valve set at about 30 cm of water, but it is just as effective, more convenient, and much simpler to blow down the tube—provided one bears in mind the baby's vulnerability to infection with even commensal organisms.

The lungs should be inflated relatively slowly using mouthfuls (not lungfuls) of air of increasing volume, attempting to achieve a square wave rather than sine wave pulse and leaving time for elastic recoil and partial expiration between each puff. The normal functional residual volume of some 30-60 ml should be achieved in a minute or so but ventilation will have to be continued thereafter till the baby begins to breathe spontaneously or is clearly dead.

THE CIRCULATION

In most circumstances artificial ventilation will induce adequate perfusion of the lungs, but in profound asphyxia the circulation

will also have to be re-established right at the start if oxygen is to be taken up. If the heart was heard immediately before birth even a stillborn infant can often be revived by external cardiac massage and the injection of buffer or alkali into the umbilical vein. These measures are also indicated when the pulse is very slow or the infant obviously shocked. External cardiac massage in babies is usually performed by pushing the upper end of the sternum back against the spine using two or three fingers of one hand and feeling for the carotid pulse with the other to gauge the effect; this will empty the dilated and feeble heart and cause it to contract more vigorously. Pressure over the lower sternum or too forceful massage can rupture the liver and bruise the heart or lungs. Cardiac massage and inflation of the lung may be carried out by the same operator in alternation, two or three inflations being followed by 10 to 15 beats until the circulation is re-established. When this is re-established it is helpful to inject into the umbilical vein towards the umbilicus 5 ml of 5.0% sodium bicarbonate or 3.6% Tham solution, which should be available in vials for this purpose. If the cord has not been tied raising the placenta will help to wash the injected material into the infant with placental blood.

OTHER MEASURES

Nalorphine hydrobromide (Lethidrone), 1 mg may be given at the same time by the same route if narcosis with pethidine or opiates seems to be contributing to the baby's difficulties, special care being taken to use the vein rather than the artery for this purpose; in some cases 10 ml of 10% dextrose followed by saline may also be valuable.

In my opinion no great harm and conceivably some good will result if during these manoeuvres the baby cools off considerably, as he inevitably will—but once he begins to revive he should be kept warm. This involves drying him on a warm towel, providing a source of radiant heat (a powerful light bulb will serve but should not be allowed to come too close), and dressing him in a cap and gown or a silver swaddler.

FURTHER MANAGEMENT

At this point, with the immediate crisis over, arrangements should be made to transfer the baby to the nearest special care baby unit, making sure that he is kept warm and under surveillance en route with the cord securely clamped and the endotracheal tube strapped in place through a tracheostomy tube used as an oral airway if there is any doubt about his ability to maintain spontaneous breathing.

Over the subsequent 96 hours the baby is in danger of developing infection, hypoglycaemia, and fits, and all these will have to be looked for and dealt with if he is to have the best chance of surviving without cerebral damage.

LONG-TERM EFFECTS

It is worth remembering that usually by itself birth asphyxia seldom causes serious neurological damage and that the vast majority of survivors will have no detectable disability on entering school, even when they were apparently stillborn. Moreover, energetic resuscitation may prevent disability in babies who would have survived damaged without it. Nevertheless, careful follow-up is always mandatory in such cases.

PREMATURE BABIES

In immature babies subsequent respiratory and metabolic problems are less likely to be troublesome if the initial care at

birth has been satisfactory and if asphyxia, cooling, and infection have been dealt with or prevented. Thus if a family doctor is called to attend a woman who is in premature labour at home he should try to ensure that the baby reaches hospital in the optimum condition—always remembering that the best portable incubator is the mother.

Other Emergencies at Birth

Emergencies other than asphyxia are very rare in domiciliary practice, but occasionally a baby will lose a lot of blood into the uterine cavity or maternal circulation and will be born in a state of shock with air hunger. In these circumstances the injection of buffer or alkali before transfer may be life-saving and transfusion with blood or a plasma expander may also be given with advantage if the doctor has taken the precaution of having plasma or a bottle of blood compatible with the mother available. It should be remembered that the normal baby's total blood volume is unlikely to exceed 300 ml and that therefore even when the blood loss has been considerable a 50-ml transfusion should suffice in most instances.

Very occasionally a baby may be born with unexpected haemolytic disease or idiopathic hydrops with a very low haemoglobin level, a high circulating blood volume, and ascites. In these cases the removal of 50 ml of blood from the umbilical vein may be life-saving, as is also sometimes aspiration of the

peritoneal cavity or pleura when accumulated fluid interferes with expansion of the lungs.

In both these circumstances immediate transfer to a special care unit should be arranged once the urgent threat to life is over; and in most cases it will be wise for the doctor or midwife to accompany the baby to hospital with a record of what has been done.

Equipment Needed for Resuscitation

Stop-watch
Electric or water jet vacuum pump (for fitting to tap on wash basin) (high suction pressures are not necessary and potentially damaging)
Mucus extractor
Airways—one each of 0, 00, 000
Endotracheal tubes FG, 10, 12, 14—8 with introducer
Laryngoscope and infant blade
Syringes and hypodermic needles
Ampoules of nalorphine hydrobromide (Lethidrone), 1 mg for injection intravenously or intramuscularly
Tham, 5 ml 3.5% solution—for intravenous or intraperitoneal injection
Sodium bicarbonate 5%, 10 ml for intravenous injection
Normal saline for injection, 100 ml
Heparin solution 1,000 i.u./ml
10% glucose solution for intravenous injection
Silver swaddlers

I believe that if general practitioners with a special interest in obstetrics made themselves skilled in the techniques of resuscitation and ensured that they were on the spot and properly equipped at delivery, domiciliary midwifery might once again become safe and acceptable for the many parturient women who would rather have their babies at home.

Any Questions?

We publish below a selection of questions and answers of general interest

Osteoporosis after Trauma

What is the prognosis of localized osteoporosis after trauma? Is there any treatment for it?

Localized osteoporosis following trauma is for practical purposes always due to disuse. In the present day this is largely avoided by making the patient active but obviously in some injuries this is not possible. Active use of the limb rapidly restores the bone to a satisfactory state though if osteoporosis has been severe it remains radiologically detectable.

Loss of Libido in Depression

A man of 47 with mild depression who has responded to amitriptyline treatment still suffers from lack of libido. When coitus does take place ejaculation rarely occurs. What investigations should be done, and what is the treatment?

Apart from physical examination to evaluate masculine development and the condition of the genitalia, to exclude neurological disease, and to exclude disease of the prostate gland, investigation should include testing for glycosuria. If glycosuria is found, a glucose tolerance test should be done. Seminal analysis (it is usually possible to produce an ejaculate by masturbation) and plasma testosterone determination should also be carried out.

Only if the plasma testosterone is significantly reduced is replacement with testosterone preparations likely to be successful. Long-acting preparations by injection are preferable, for instance, testosterone oenanthate 250 mg fortnightly or testosterone implants—e.g., 6-8 100 mg pellets sub-

cutaneously every six months. A normal seminal specimen virtually excludes organic factors—though not necessarily diabetes, and makes a psychological aetiology, which is most probable anyway, inescapable. Psychotherapy is usually difficult in cases of this kind and not often effective.

Quinine for Night Cramps

Quinine bisulphate is used to treat night cramps in the legs with subjective improvement. Is there any evidence on its mode of action?

Quinine compounds have definite effects upon skeletal muscle. Quinine increases the tension response of the muscle fibre to a single maximal stimulus delivered either directly to the muscle or through the nerve but it also increases the refractory period of muscle so that the overall response to tetanic stimulation is diminished. Quinine also decreases the excitability of the motor end-plate region so that the response to both repetitive nerve stimulation and to acetylcholine is reduced. Clinically these effects have an application in both myotonia, which is improved by the administration of quinine, and in myasthenia gravis, in which the muscular weakness is increased by quinine.

The precise physiological mechanism of night cramps is not known but it is on the basis of the known effects of quinine on skeletal muscle—particularly its effect in myotonia in which failure of muscle relaxation is important—that the drug is used for the treatment of nocturnal cramp. It is often very effective. In some patients nocturnal cramp is associated with obliterative arterial disease of the lower limbs and in such cases a vasodilator drug such as cyclandelate may be more effective than quinine.