RESUSCITATION OF THE NEWBORN

The 1970 British Birth Survey showed that 5% of infants did not establish respiration until more than three minutes after birth, and 53% of neonatal deaths occurred in this group. The number of infants who have cerebral palsy or mental retardation related to inadequate resuscitation is unknown. Wherever babies are delivered there should be a person with adequate skill and experience in resuscitation immediately available throughout the 24 hours. Many babies can be resuscitated with a closely fitting mask and an inflatable bag with a valve. The equipment is cheap, simple to use, and can be carried in a small case. Some infants cannot be resuscitated by this method but require intubation, which to be successful should be done by a doctor or midwife with continual experience of the procedure.

Assessment

	0	1	2
Appearance (colour)	Blue, pale	Body pink, extremities blue	Completely pink
PULSE (heart rate)	Absent	Below 100	Over 100
Grimace (response to stimulation)	No response	Grimace	Cry
Activity (muscle tone)	Limp	Some flexion in extremities	Active movements
RESPIRATION (respiratory effort)	Absent	Slow irregular	Strong cry

In British hospitals about 7% of infants are intubated after birth. In only about half these cases can the need for intubation be predicted by the presence of high risk factors: fetal distress, caesarean section, maternal anaesthetic, preterm infant, breech delivery, difficult forceps delivery, twins, maternal diabetes, and rhesus incompatibility. The Apgar scoring system is used to assess the infant's condition one minute and five minutes after birth. A numerical score is given for each of five features. As the heart rate and respiratory effort are the only items which determine the action to be taken, some units have abandoned this score.

Procedure

Immediately after the delivery of the head, the infant's pharynx should be aspirated by a mucus extractor with a fluid trap or a large soft PVC catheter attached to a vacuum bottle. This procedure is carried out gently under direct vision and the catheter should not touch the back of the pharynx repeatedly as reflex apnoea may occur. After complete delivery of the head, oxygen should be given by funnel so long as central cyanosis is present (while the tongue is blue). If the infant does not breathe by 30 seconds after birth the closely fitted mask is applied to the face with the head extended, and the attached bag should be squeezed a few times. Air is usually used but oxygen can be introduced into the bag through a side arm.

Failure to improve

If there are no spontaneous respiratory movements at the end of one minute after birth or if the heart rate is less than 100 beats/min at any time, the infant should be placed supine on a flat surface. The laryngoscope is held in the left hand and passed over the infant's tongue as far as the epiglottis. The tip of the blade is advanced over the epiglottis about another 0.5 cm and is then withdrawn slightly. This presses the epiglottis against the root of the tongue, revealing the glottis. In the newborn the glottis is a slit in the centre of a small pink mound and the slit may expand into a triangular opening during a gasp. Gentle backward pressure on the infant's larynx by an assistant may help to bring the glottis into view. Secretions in the pharynx should be aspirated with a large catheter, for example FG9. The endotracheal tube held in the right hand is then guided through the larynx about 1 to 2 cm into the trachea.

Intermittent positive pressure should be applied at a rate of 15 times per minute with an inflatable bag with a valve.

The positive pressure applied must not be higher than 30 cm H₂O; otherwise there is a danger of rupturing the lung and producing a pneumothorax or pneumomediastinum. These low pressures are enough to induce a gasp reflex, which is then followed by normal respiratory movements of the chest. A return to a normal heart rate is a good sign that resuscitation is satisfactory. If the endotracheal tube has to be left in place for a short period, the tube should be fixed to the cheek by adhesive tape.

Aspiration of secretion in the endotracheal tube and in the trachea can be carried out with a fine catheter (suction catheter FG 4-5). The shoulder on the endotracheal tube is designed to prevent the tube going into the right main bronchus, but this may still occur. If breath sounds are heard equally on both sides of the chest the tube is probably in the trachea and not beyond the bifurcation.

The stomach should be emptied using a feeding tube while the endotracheal tube is in place. Intermittent positive pressure should be stopped every three minutes for about 15 seconds to determine whether spontaneous respiratory movements will start.

During prolonged apnoea the blood pressure is maintained initially but later falls. If the heart rate is less than 100/min a short period of cardiac massage should be given at the same time as efforts to start respiratory movements. Cardiac massage is carried out by applying firm pressure with two fingers in the third and fourth intercostal spaces to the left of the sternum.

Hypothermia is a special hazard for infants who have been resuscitated and exposed during these procedures. Rapid initial drying of the infant with a warm towel is the most important preventive factor, but resuscitation should also be carried out under a radiant heater of at least 400 watts. After resuscitation the infant should be wrapped up and handed to his mother for at least a minute or two even if he has to be placed in a transport incubator and taken to the special care unit. Most full-term infants who have required resuscitation do not need to be admitted to the special care unit.

The best sign that resuscitation has been successful is an increase in heart rate. If this does not occur within about 15 seconds the following should be considered. (1) The gas cylinders may be empty or the pipe line disconnected. (2) The endotracheal tube may have been misplaced into the oesophagus or have slipped out of the trachea during extension of the neck. If there is any doubt, the tube should be removed and a fresh tube inserted immediately. (3) The endotracheal tube may be in the right main bronchus. After these possibilities have been excluded other diagnoses to be considered are pulmonary hypoplasia associated with Potter's syndrome (renal agenesis with a squashed facial appearance and large, low-set floppy ears) and diaphragmatic hernia.

Drugs

If the mother has recently received pethidine or morphine a chemical antagonist can be given to the infant. If the infant needs both intubation and drugs, intubation should always be performed first. The only chemical antagonist available is naloxone, but its period of action is short. The manufacturer's current recommended dose is 0.01 mg/kg body weight, which can be given intramuscularly or intravenously.

An adequate supply of oxygen quickly reverses acidosis and it is rarely necessary to consider giving intravenous glucose and sodium bicarbonate solution.

Discussion with parents

If the infant is breathing normally, he should be given to his mother after a rapid examination. She should be told that the infant seems to be normal and that it is common for infants to need help with breathing at birth. It is important to emphasise that his progress will be no different from that of other infants who have not needed resuscitation. Most infants who have required intubation should go with their mothers to the postnatal wards and receive routine observation. Only if there has been a prolonged period before the establishment of spontaneous respiration should the infant be taken to the special care unit.

If resuscitation has not been successful, the person responsible for resuscitation, together with a member of the obstetric staff, should see both parents immediately. The parents should be asked whether they would like to see the dead infant, who should be suitably wrapped up before being brought in to them. A nurse is usually with the parents so she can answer questions about the baby's appearance. The mother may be anxious to hold the baby, and if so it may be kinder to leave her alone to grieve over her dead baby for a few minutes. Discussion with the parents will help to decide who is the best person to help them with their grieving and with the reactions of the other children in the family. The family doctor should be told by telephone as soon as possible.

Dr H B Valman, MD, FRCP, is consultant paediatrician, Northwick Park Hospital and Clinical Research Centre, Harrow.

- (a) Resuscitaire equipment (reproduced by kind permission of Vickers Medical)
- (b) Penlon bag with face mask and endotracheal connections
- (c) Small laryngoscope with straight 10-cm blade
- (d) Mucus extractor
- (e) Neonatal endotracheal tube