Cardiopulmonary resuscitation in late pregnancy

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Prompt delivery must be considered for successful cardiopulmonary resuscitation in late pregnancy

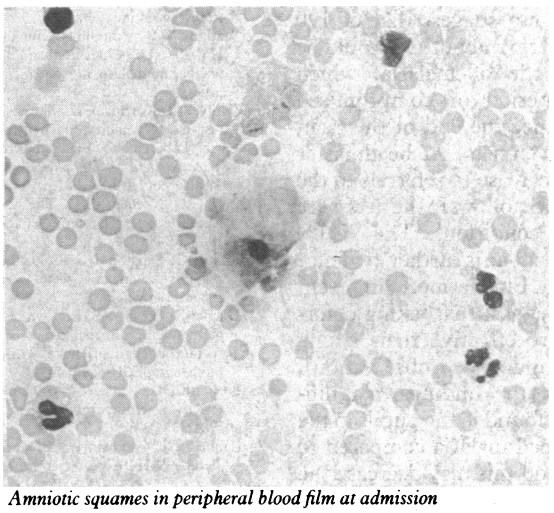
The most recent report on maternal mortality (1979-81) found that half the direct maternal deaths are due to acute causes,[1] hence resuscitation techniques must remain an essential part of the training of staff caring for pregnant women. In the third trimester of pregnancy resuscitation is complicated by compression of the aorta and vena cava by the uterus.[2] We describe a case in which caesarean section was performed as part of the resuscitation of the mother, resulting in survival of the mother and baby.

Case report

A 27 year old woman (gravida 2, para 1) was admitted to the casualty department at 38 weeks' gestation having collapsed at home about 10 minutes earlier. Her antenatal history had been uneventful, and there was no history of uterine contractions or ruptured membranes. On admission she was deeply cyanosed and apnoeic and had fixed, dilated pupils and no pulse. Cardiopulmonary resuscitation was started, she was intubated, and a right internal jugular line was inserted. An electrocardiogram of the mother showed asystole. She was tilted to the left lateral position, but resuscitation in this position proved difficult. Examination showed that the size of the uterus was compatible with her dates; the single fetus presented cephalically, and the fetal heart was not heard.

Five minutes after admission a lower segment caesarean section was performed while the patient was on the casualty trolley. The amniotic liquor was stained with blood, but there was no evidence of placental abruption. A male infant was delivered within one minute. The uterus was atonic, and there was no bleeding during the operation. Cardiopulmonary resuscitation was continued throughout. Immediately after delivery the mother developed ventricular fibrillation, which was successfully treated with defibrillation. She was transferred to the intensive therapy unit 15 minutes after arrival.

Results of tests on a blood sample taken on admission were consistent with disseminated intravascular coagulation and showed amniotic squames consistent with amniotic fluid embolism (figure). Heavy vaginal bleeding occurred, and there was oozing from the abdominal wound. The disseminated intravascular coagulation was corrected with an infusion of packed cells, cryoprecipitate, platelets, and fresh frozen plasma.



Amniotic squames in peripheral blood film at admission

Twenty hours after operation she developed severe bilateral pulmonary oedema. Total support was continued until extubation on day 14, when a tracheostomy was inserted; this was removed on day 39. A neurologist stated that her prognosis for survival was excellent but that her intellectual function was likely to be poor. At 16 months her physical condition was good, with minimal weakness on the right side. She was continent of urine and faeces. Her mental state remained severely impaired and her speech poor, and she needed constant attendance by her family.

The infant (birth weight 3270 g) was born with no detectable heart rate. He was intubated at one minute and had Apgar scores of 0, 4, and 5 at 1, 5, and 10 minutes, respectively, and started spontaneous respiration at 12 minutes. After infusion with sodium bicarbonate at 20 minutes the pH of capillary blood was 7·19. He was intubated and transferred from the casualty department to the special care baby unit 5 km away, where he was extubated a few hours later. He was discharged home on day 9, when the results of all investigations were normal. His development was normal at 6, 12, and 16 months.

Discussion

Katz *et al* stated that if cardiopulmonary arrest occurs in late pregnancy a caesarean section should be performed in an effort to save the baby and also the mother.[3] In this case the mother's condition improved immediately after delivery. Though cardiopulmonary resuscitation is accomplished most effectively with the patient supine on a hard surface, in late pregnancy aortocaval compression occurs and in most women the inferior vena cava is obstructed, so that venous return to the heart is decreased.[4] This compression can be relieved only by tilting the patient laterally or by delivering the baby. Experimental evidence[5] and clinical experience[6] have suggested that resuscitation is unlikely to be successful when the inferior vena cava is occluded. The patient's size and shape also hinder successful resuscitation, and the weight of the engorged breasts on the chest makes mouth to mouth ventilation and endotracheal intubation difficult.

A recent study by Rees and Willis, who used a simulator, showed that mouth to mouth resuscitation and external compression of the chest can be performed effectively with the patient tilted at an angle of 30° or less.[7] They described an inclined resuscitation wedge for use in midwifery that relieves caval compression and allows access to the patient should surgical intervention be required.

The nursing staff, who are usually the first at the scene in cardiac arrest, should turn the patient to the left to relieve caval compression before starting resuscitation. An acceptable alternative would be manual displacement of the uterus to the left and toward the head with the patient supine.[2] If resuscitation is unsuccessful within five minutes

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the uterus must be emptied. Delivery of the infant improves maternal circulation and increases venous return. After delivery pressure in the inferior vena cava promptly returns to prepregnancy values[8] and cardiac output increases by 60-80% of prepregnancy values.[9]

Urgent operation is critical to mother and baby. Anoxia causes irreversible brain damage in an adult in three to four minutes, and hypoxia develops sooner in pregnancy.[10] Unfortunately, the period of cardiac arrest in our patient was at least 15 minutes, and the neurological sequelae showed the effect of such anoxia.

Review of published reports shows that 70% of neonatal survivors delivered up to five minutes after maternal death were normal.[4] Weil and Graber reported on a normal neonate delivered after 15 minutes of unsuccessful cardiopulmonary resuscitation.[11] In our case the infant, despite anoxia of more than 15 minutes and no detectable heart rate at birth, survived without any neurological problems. Although caesarean section is done primarily for the mother's benefit, it may also help the baby's chance of survival. Cardiopulmonary resuscitation must be continued throughout the caesarean section to maintain blood flow as this increases the chance of a successful maternal and neonatal outcome.[12]

Amniotic fluid embolism is rare but has a mortality of over 80%.[13,14] It is associated with increasing age and parity and with short, tumultuous labours, but it rarely occurs before the onset of labour. Treatment is threefold: control of the bleeding diathesis, which occurs in 30% of patients; replacement of blood; and, most importantly, cardiopulmonary resuscitation. Amniotic fluid embolism can be diagnosed in survivors by the finding of elements of amniotic fluid in the maternal circulation.[15]

Recent guidelines from the Royal College of Physicians outline the difficulties in resuscitating pregnant women and support the use of emergency caesarean section as part of the procedure.[16] We agree with other authors[3,12] that if the patient does not respond after five minutes of cardiopulmonary resuscitation, taking caval compression into account, then a caesarean section should be performed, cardiopulmonary resuscitation being maintained throughout and after delivery. Such aggressive management can further decrease maternal mortality.

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Clinical Algorithm

Decision making for routine measles/MMR and whooping cough immunisation

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In the United Kingdom the uptake of vaccination against measles and whooping cough is low. Uptake rates for measles vaccination are comparable with those in west Asian countries and those for whooping cough vaccination with those in African countries rather than those in other industrial countries.[1] The introduction of a combined measles-mumps-rubella (MMR) vaccine in October this year will give the Department of Health and Social Security an opportunity to mount a major promotional campaign to try to counter this low uptake rate.

The problems underlying this failure to vaccinate are complex, reflecting professional as well as public attitudes. All the evidence is, however, that enthusiastic, well organised practitioners and health districts can override such factors and at least approach[2-4] national targets,[5] even in areas of deprivation.[4-6] Health care professionals advising parents face the problem that much false information exists about contraindications and that individual circumstances are sometimes complex.[7]

To aid the promotion of vaccination we have prepared annotated algorithms to guide in making decisions on vaccinating individual children. They also estimate the maximum uptakes given the updated contraindications.[8]

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