coincidental remains to be seen. If encephalitis is a true complication, in infants, of this important immunological procedure, then the exact cause and incidence have yet to be ascertained.

I am indebted to the late Dr. Stuart I. A. Laidlaw, when Medical Officer of Health for the City of Glasgow, and Dr. J. H. Hutchison, consultant paediatrician, Royal Hospital for Sick Children, Glasgow, for permission to report this case. My thanks are also due to Dr. H. J. Parish, of the Wellcome Research Laboratories, for the interest he has shown.

Since this paper was submitted a further case in an infant of 3 months has been reported by Beet (1955).

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Late Result of Prolonged Endotracheal Insufflation in Asphyxia Neonatorum

Recovery from asphyxia neonatorum following prolonged endotracheal insufflation has been described by Lord *et al.* (1953) and Holmes and Payne (1955), but no follow-up of these cases is reported. The case reported here may therefore be of interest, and should make one consider to what extent "heroic" attempts at resuscitation are justified.

CASE REPORT

The mother was a secundigravida aged 30. In her first pregnancy, five years previously, the foetal head failed to engage until labour began at full term. Normal delivery of a female infant weighing 6 lb. 11 oz. (3 kg.) had occurred after a labour lasting 27 hours. In her present pregnancy there had been no complications, but the sacral promontory was easily reached on vaginal examination, and a standing lateral x-ray film of the pelvis at 40 weeks confirmed a slight degree of disproportion. Labour began spontaneously seven days after the estimated date of delivery and progressed normally, the first stage lasting 8½ hours. The membranes ruptured 2½ hours before delivery, and this was immediately followed by descent of the head into the pelvis in the R.O.A. position. The second stage lasted 20 minutes and an 8 lb. 13 oz. (4 kg.) male infant was born spontaneously in a state of white asphyxia. There had been no evidence of foetal distress as judged by the foetal heart sounds or meconium staining of the liquor. Pethidine was administered on two occasions—100 mg. 4½ hours and 50 mg. 1½ hours before delivery.

Initial treatment by the midwife included aspiration of the air passages, administration of oxygen by intranasal catheter, and lobeline, 3 mg., by intramuscular injection. This was followed by immersion in a warm bath. When first seen by the medical staff 15 minutes after delivery the infant was completely flaccid, the skin was mottled, and respirations were absent, but the apex beat was strong and regular at 60 a minute. Aspiration of the air passages under direct vision and intubation with a No. 00 Magill endotracheal tube with side-arm was performed. Insufflation by the method recommended by O'Brien and Roberts (1952) was carried out and nikethamide, 1 ml., administered. After five minutes the skin became pink and after one hour occasional intermittent respiratory gasps occurred. Regular respirations were established after 1½ hours, and after two hours the baby was transferred to an oxygen tent.

During the next 24 hours muscle tone returned and the baby developed a decorticate attitude, all limbs being rigid, the legs in extension and the arms in flexion. No external ocular movements were present. There was marked

opisthotonos and the fontanelles were tense. Extreme irritability occurred after the slightest stimulus. The baby was cot-nursed in a dark room and was given chloral hydrate, 1 gr. (65 mg.) three-hourly, vitamin K, 10 mg. six-hourly, and penicillin, 30,000 units six-hourly. Spasticity and irritability decreased steadily and sedation was discontinued on the sixth day. The baby sucked well from the second day and by the 13th day was fully breast-fed. A steady gain in weight was maintained after the eighth day. Mother and baby were discharged on the 15th day, the infant weighing 8 lb. 11 oz. (3.9 kg.). He appeared to be thriving and there were no obvious abnormal neurological signs. The fontanelles were not tense. The circumference of the head had increased ½ in. (1.6 cm.) since birth.

The infant has been followed up for one year. When 10 weeks old he was feeding well and gaining in weight, the arms were not spastic, but the knee-jerks were increased. Thereafter, spasticity increased, and it soon became obvious that the baby was blind. Its condition at the time of writing was pathetic—head control was that of a 3-months-old baby, and convulsions, which started at the age of 6 months, were partly controlled by primidone ("mysoline"). The head circumference was 16½ in. and there was a marked kyphosis. There was complete atrophy of the left optic disk; the right could not be visualized, but no light reflex was present. All limbs were spastic, but there had been slight improvement following physiotherapy.

COMMENT

Three major questions arise from this case.

1. How long can the foetus survive anoxia unscathed? We can assume that the period of anoxia in this case was 20–30 minutes. Total anoxia for 30 minutes has been followed by survival, but the effect on the higher centres is not known (Walker, 1954). Of 900 spastic or convulsive children there was a history of asphyxia at birth in 70% (Schreiber, 1938). In the case reported by Holmes and Payne anoxia was of at least 20 minutes' duration, but, in view of the case reported above, it cannot be agreed that the normal appearance of the child and its capacity for suckling are evidence of an intact nervous system.

2. How persistent and how determined should be our efforts at resuscitation? Holmes and Payne say, "Persevere as long as the heart beat is maintained." As a means of saving life this is undoubtedly true, but only a careful follow-up of many cases will show the likelihood of permanent morbidity. The use of endotracheal insufflation is almost certainly the most effective method of resuscitation available at present, and with skill and practice there should be little risk of trauma to the respiratory passages.

3. How can an outcome such as this be avoided? This largely depends upon whether the cerebral damage is a cause or a result of the asphyxia. In the former cases more careful assessment and treatment of disproportion and other abnormalities of labour will help, but, in the latter, improvement must centre round earlier and more efficient resuscitation. The difficulty usually is to get medical aid soon enough, but adequate oxygenation can be maintained by the midwife by the administration of intragastric oxygen. This does not get rid of excess carbon dioxide, and possibly gastric distension inhibits the onset of respirations, but it is a useful interim measure. Donald (1954) has emphasized the importance of preliminary aspiration of the stomach as well as the air passages.

My thanks are due to Mr. Anthony W. Purdie and Dr. I. G. Wickes for permission to publish this case.

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