Neonatal Hypoglycaemia

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The clinical significance of blood glucose levels in the newborn of diabetic and non-diabetic mothers is still under debate. Low blood glucose levels which would cause serious symptoms in adults have been frequently recorded in the newborn without any adverse effect. In recent years, however, neonatal hypoglycaemia when occurring in association with a characteristic symptomatology has been recognised as an important cause of cerebral damage (Cornblath et al., 1961; Brown and Wallis, 1963; Tynan and Haas, 1963; Chance and Bower, 1966). Brown (1967) reported 10 cases of symptomatic neonatal hypoglycaemia in which the blood glucose level was less than 20 mg. per 100 ml. Due to inadequate treatment in the first 6 cases, 2 babies died and the 4 survivors were left with brain damage of varying severity. Craig (1966) believes that if apnoea, cyanosis, collapse or convulsions are found in association with a blood glucose level of 10 mg. per 100 ml. or less, immediate treatment is indicated to avert death or irreversible cerebral damage. Several authorities now accept as critical hypoglycaemia a blood glucose level of 20 *mg. per* 100 *ml.* in the first week of life (Lancet, 1969).

The following case is presented as a typical example of this serious condition:

CASE REPORT

V.M., a 21 year old African primigravida was first booked at the hospital antenatal clinic on 25 April, 1969, with amenorrhoea since 23 September, 1968. Past history was not contributory.

General examination revealed no abnormality. On abdominal examination uterine enlargement was consistent with dates, that is, 30 weeks. Pregnancy progressed normally except for a blood pressure of 140/90 mm. Hg. on 2 occasions; urinalysis and weight gain remained normal. There was never any evidence of diabetes or a small-for-dates foetus.

On 24 June at 39 weeks gestation she was admitted in early labour with a blood pressure of 170/120 mm. Hg., gross oedema, a gain of 9 pounds during the previous 6 days, and albuminuria of 100 mg. per 100 ml. Artificial rupture of the membranes released meconium stained liquor. In spite of heavy sedation the patient's condition worsened. Caesarean section was performed for fulminating toxaemia and foetal distress. A 7 lb. 12 oz. male infant with an Apgar score of 5/10 requiring endotracheal intubation was delivered. Regular respirations were established in 7 minutes. The baby was given Konakion 1mg. and tranferred to an incubator, and a course of Ampiclox (Beecham) was prescribed. About 2 hours later the baby was found to have tremors and cyanosis with episodes of complete apnoea, without the intercostal recession and increased respiratory rate associated with respiratory distress syndrome. Blood was taken for urgent glucose estimation, and was reported as 9mg. per 100ml. Glucose was administered per umbilical vein. The infant soon responded. Five hours later, however, the pathological features reappeared when the blood glucose was estimated as "less than 10mg. per 100ml.". A further 5ml. of 50% glucose was given via the umbilical vein and the drip of 10% glucose continued at the rate of 90ml./Kg./day. Repeat blood glucose in 24 hours was 53mg. per 100ml. Uneventful recovery followed and the drip was discontinued in 30 hours and adequate calories given orally. Hydrocortisone mg. 10, commenced on the first day was gradually reduced. Daily glucose estimations were carried out for 3 days, and then weekly for the first month. The readings varied between 52 and 89mg. per 100ml. When last seen at about 5 months the baby was thriving and normal in all respects.

DISCUSSION

Incidence: In 1,000 consecutive neonates admitted to a special care unit 31 cases of hypoglycaemia were discovered (Campbell et al. 1967). Of these 21 cases were symptomatic.

Symptomatic neonatal hypoglycaemia occurs more commonly in dysmature or low-birth-weight babies due to intra-uterine malnutrition. The following conditions are more liable to be associated with intra-uterine malnutrition: pre-eclamptic toxaemia, hypertensive states, diabetes, recurrent ante-partum haemorrhage, heart disease, chronic renal disease, foetal malformation and 'placental insufficiency'. Other conditions known to favour hypoglycaemia are respiratory distress syndrome and prematurity (Lancet, 1969), and neonatal cold injury (Brown, 1967). Neonatal hypoglycaemia may also be an early manifestation of glycogen storage disease, islet tumour of the pancreas, idiopathic spontaneous hypoglycaemia of infancy and childhood, and salicylate poisoning (Pickering, 1968).

Hypoglycaemia is considered to be due to the increased brain: liver ratio resulting from intra-uterine malnutrition. Gruenwald (1963) pointed out that the liver in the neonate is the only endogenous source of

glucose and that most of the glucose is utilised by the large brain. The malnutrition has little effect on the brain, but causes a marked reduction in the relative size of the liver (Cornblath et al., 1963; Crosse, 1966). Consequently the glycogen store in the liver becomes depleted. Glucagon does not alter the blood glucose while symptoms persist. This is confirmatory evidence that hypoglycaemia occurs when the hepatic glycogen is depleted (Brown, 1967).

Clinical manifestations may occur soon after birth as in the case described, but more commonly occurs during the first week. Tremors, cyanosis, episodes of apnoea or respiratory distress, and convulsions are usually followed by lethargy, eye-rolling, fall in body temperature, feeding difficulties, hyperirritability, drowsiness, collapse or coma. The diagnosis is confirmed by a blood glucose level of 20 mg. or less per 100 ml. Polycythemia, thrombocytopenia and hypocalcaemia may be found. The latter is more liable to occur, as a separate entity, in dysmature babies and is due either to an increase in the serum phosphorus or a decrease in the serum calcium.

Management. All dysmature and premature neonates manifesting the characteristic symptomatology must be carefully examined to exclude other commoner conditions. Blood must be taken for an immediate glucose estimation and repeated every 24 hours. Shelley and Neligan (1966) recommend that intra-venous glucose be administered and the clinical response observed because intracranial birth injury or infection and hypoxia of any origin may present similarly. Every symptomatic neonatal hypoglycaemia must be treated without delay.

Our regimen of treatment is as follows: Early feeding with sufficient calories in all "at risk" infants is encouraged, especially dysmature and premature babies, and infants born of mothers with hypertension, toxaemia and recurrent ante-partum haemorrhage unless contra-indicated for some other reason. The infant is placed in an incubator to allow careful observation and warmth; the latter decreases basal metabolism and the utilisation of glucose by the tissues. As soon as the diagnosis is suspected on clinical grounds, blood is drawn for glucose estimation and 5ml. of 50% glucose is injected intravenously while awaiting the laboratory results. We feel that this acts as a good diagnostic as well as therapeutic test; remarkable alleviation of signs and symptoms result in the event of hypoglycaemia. If the diagnosis is confirmed biochemically, an infusion of 10% glocose (90ml. Kg./24 hours) is administered for 24-48 hours. Depending on the symptoms and the repeat blood sugar estimations oral feeds consisting of either half strength breast milk or half strength cow's milk diluted with 10% glucose is given, if necessary, via an indwelling intragastric catheter at 90ml./Kg./day. Hydrocortisone 10mg. every 6 hours is given and this is gradually decreased over a week. The infant is usually out of danger in a few days but continued observation and, if indicated, blood glucose estimations may be necessary for a few weeks. If hypocalcaemia is associated with this condition 3ml. of 10% calcium gluconate may be given by slow intravenous injection.

The adult blood glucose level is usually recorded within a month as in the case described. The occasional recurrence as late as the age of 8 months has been reported (Nelson, 1964).

Prognosis. Follow-up after treatment has not yet been long enough, but permanent brain damage has been reported in survivors (Brown and Wallis, 1963; Chance and Bower, 1966). Mental defect approaches 20% in some series (Nelson, 1964).

Prophylaxis. Early feeding of all "at risk" infants and warmth appear to be the most important preventive measures (Brown, 1967; Lancet, 1969). While it is agreed that early feeding may predispose to hypocalcaemic convulsions, its incidence may be greatly reduced by the low phosphorus content of breast milk or half strength cow's milk. Secondly, when the characteristic symptoms appear prompt treatment is essential to avoid death or damage of the brain.

SUMMARY

A case to illustrate the clinical features of symptomatic neonatal hypoglycaemia is presented. The importance of early diagnosis and prompt treatment is emphasised, and a regimen of therapy is recommended.

The condition is largely preventable by attention to warmth and early feeding of all "at risk" babies. Awareness of this condition and its immediate treatment may eliminate the 20% mental defectives occurring in the survivors.

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