duction) at 20 months shows him walking normally, but with the skull deformity already apparent. At 3 years he had active rickets (Fig. 2). He was given routine antirachitic treatment (sunlight and fish-liver oils). When first seen by us in August, 1952, at 6½ years, his wrists were as shown in Fig. 3. His skull deformity is shown in Figs. 4 and 5.

Biochemical Investigations (in each case the mean of two or more estimates is given).—Serum calcium, 10.2 mg. per 100 ml.; plasma inorganic phosphate, 2 mg. of phosphorus per 100 ml.; alkaline phosphatase, 31 King-Armstrong units; blood urea, 26 mg. per 100 ml.; urea-clearance test (Van Slyke), 120% of average normal; urine, N.A.D. on numerous occasions. In addition the following were found on one occasion each: plasma chloride, 100 mEq per litre; alkali reserve, 27 mEq per litre; fasting blood sugar, 88 mg. per 100 ml.; faecal fat, 15.7 g. per 100 g. dried faeces (unsplit, 1.4 g.); three-day fat balance, absorption 94%.

After treatment with 50,000 i.u. of vitamin D daily by mouth, starting in early September, 1952, the serum calcium

FIG. 4.—The patient aged 6½.

rose slightly to 11.2 mg. and the plasma inorganic phosphate rose progressively to 2.7 mg. after three weeks and to 4.3 mg. in six weeks, but fell to 2.4 mg. after 25 weeks of the same treatment. The alkaline phosphatase did not vary significantly over this period. The only definite biochemical abnormalities were the low plasma inorganic phosphate and the

slightly raised phosphatase. The former responded temporarily to the relatively small dose of vitamin D. Renal function remained normal throughout.

We are indebted to Dr. C. H. Wood, for the following report: "November, 1948:—Generalized decalcification with bowing of long bones; widening of the space between

epiphyses and metaphyses; saucer-shaped and irregular metaphyses; these changes are more advanced in the legs. Skull: marked scaphocephaly with closure of the sagittal suture. August, 1952:—Appreciable improvement since earlier films, although not healed. February, 1953:—Improvement maintained, but still not healed; x-ray films of patient's mother showed typical changes of healed rickets but no scaphocephaly."

There seemed to be little doubt of the diagnosis of vitamin-D-resistant rickets, and more vigorous therapy was instituted. In addition he has well-marked craniostenosis from premature fusion of his sagittal suture, a condition only once previously described in association with resistant rickets.

Summary

The second reported case of craniostenosis associated with vitamin-D-resistant rickets is presented together with evidence to suggest that the association of these conditions may have occurred previously and been mistaken for a purely rachitic phenomenon.

We are indebted to Dr. J. M. Macfie for permission to publish this case; to Dr. C. H. Wood for the x-ray films; and to the department of clinical photography, General Hospital, Nottingham, for the other illustrations.

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ANAESTHESIA IN HOSPITAL BREECH DELIVERY

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FIG. 5.—Skull (aged 6½).

For practical purposes an infant may be delivered by the breech in one of two very different ways: an assisted breech delivery or breech extraction. The two essential features of the former type of delivery are that labour should be left to the natural forces so far as possible and that any intervention should imitate the normal mechanism of breech delivery. In practice this implies that assistance is confined to the birth of the arms and, more especially, of the head. In contradistinction to an assisted breech delivery, delivery in a breech extraction is entirely operative, the maternal powers playing no part. In most cases intervention is undertaken before the breech has started to distend the vulva, the legs being brought down and delivery completed by a combination of traction and gentle fundal pressure.

In the absence of definite indications for early delivery, choice of methods is dictated by consideration of the foetal hazards. These have been shown to be due to two factors—namely, trauma and anoxia, of which the former is by far the more

common. Although trauma may at times be due to disproportion, in the great majority of instances it may be directly ascribed to one or more of the following causes: undue manipulation of the foetus; manipulation carried out under difficulties; and uncontrolled delivery of the after-coming head. Ideally, therefore, an assisted breech delivery should always be aimed at, since it demands the minimum of intervention. Where, however, indications arise for a breech extraction, it is important that the necessary manipulations—which often involve the passing of the whole hand into the uterine cavity—should be rendered as atraumatic as possible by ensuring good relaxation not only of the perineal floor but also of the uterus itself.

In addition, in both these methods of delivery the foetus may have to undergo a period of oxygen deprivation before delivery of the mouth.

From what has been said, it will be evident that the anaesthetic requirements in breech delivery will to a large extent depend upon the obstetric procedure decided on. Thus, in an assisted breech delivery there must be good oxygenation, restraint in inducing anaesthesia prematurely at a time when reliance should be placed upon the mother's expulsive powers, and rapid and smooth induction of anaesthesia when this is finally necessary. In a breech extraction, on the other hand, as well as good oxygenation there must be good relaxation both of the uterus and of the muscles of the perineal floor.

Analgesia.—No contraindication exists to pethidine, given in doses of 100–150 mg. (Nixon and Ransom, 1951) during the first stage of a breech delivery. Although that drug may depress the foetal respiratory centre to a slight extent, this is not necessarily a disadvantage, since respiratory efforts are best delayed until after the delivery of the mouth. Inhalation analgesia may be required at times to supplement the effect of pethidine. For the period preceding the birth of the breech a nitrous oxide and oxygen mixture (75% and 25%) has the advantage of providing good oxygenation.

Assisted Breech Delivery

Perineotomy

This operation is an essential procedure in all primiparae and in most multiparae. It should be deferred until the breech is widely distending the perineum, in order to reduce the amount of blood loss. The incision should be made under local infiltration analgesia, preferably 1% lignocaine hydrochloride ("xylocaine"). By this means, despite a temporary inhibition of the perineal reflex, strong expulsive efforts usually return within two to three minutes and result in the spontaneous delivery of the breech and trunk.

Some workers (Urnes and Timerman, 1937; Greig, 1945; Trites, 1948) prefer pudendal block to the local infiltration described above, it being claimed that this procedure gives enough analgesia for the safe and painless completion of delivery. In experienced hands this is a valuable method for selected cases, but it possesses certain disadvantages: (1) If it is carried out too soon the resulting interference with the perineal reflex reduces the incidence of spontaneous delivery of the breech, and early intervention is correspondingly more common. (2) If, in order to derive the maximum benefit from the mother's expulsive efforts, analgesia is delayed until the breech is distending the perineum, it may be impossible to reach the ischial spines. The pudendal nerve must then be blocked at its exit from Alcock's canal at the ischial tuberosities. Since this point cannot at times be determined with accuracy, the resultant analgesia may be insufficient for the routine application of

forceps to the after-coming head, a procedure which we strongly advocate in all cases. (3) The extent of analgesia is insufficient for the safe and effective correction of some of the complications which may arise in the course of delivery.

Delivery of the Arms and Head

While in agreement with a policy of minimal intervention in assisted breech deliveries, we do, however, feel that if carried to excess it imposes a definite risk on the foetus. Occasions may arise, especially in relation to the delivery of the after-coming head, when, owing to unforeseen difficulties, simple measures do not suffice and a sudden need for anaesthesia arises often after loss of much valuable time. It is therefore our custom to allow spontaneous delivery to proceed only until the angles of the scapulae are visible. At this stage anaesthesia is induced, after which the arms are brought down by Løvset's manoeuvre and the forceps applied to the after-coming head.

As already stated, the chief anaesthetic requirements in this type of delivery are that induction should be smooth and swift while maintaining good oxygenation. Every experienced anaesthetist develops his own techniques with which he produces the best results, but for the benefit of those approaching this problem for the first time we feel that mention should be made of some disadvantages of two common methods of induction: (1) thiopentone, and (2) gas, oxygen, and ether. Thiopentone sodium (5% solution) has many advocates (Dippel *et al.*, 1947; Kerr and Moir, 1949; Cox, 1950; Calverley, 1950; Dewhurst, 1952), and at first sight would seem to fulfil all requirements. It is, however, widely felt that the danger of regurgitation and inhalation of stomach contents is a contraindication to the extended use of this substance. With gas, oxygen, and ether, induction is either too slow for the purpose under discussion, or, should induction be deliberately hastened, a period of reduced oxygen intake often results.

We would like to suggest that divinyl ether has properties which recommend it for use in assisted breech deliveries. It may be given in a variety of ways, our preference being to combine it in a closed circuit with oxygen and cyclopropane. After this, anaesthesia may be continued with any suitable mixture, such as gas, oxygen, and ether.

Some obstetricians (Allan, 1935; Rosenfeld, 1940; Cunningham, 1945) recommend that general anaesthesia be induced as soon as the perineum is distended by the breech. We do not, however, subscribe to this view, since the resultant interference with voluntary expulsive efforts substantially increases the frequency and extent of operative interventions. For the same reason low spinal or extradural anaesthesia (Urnes and Timerman, 1937; Kerr and Moir, 1949) are unsatisfactory. In addition, in the case of spinal anaesthesia there is a slight but definite risk associated with the injection of foreign material into the cerebrospinal fluid.

Neither of the two methods referred to above outweighs in advantages a general anaesthetic withheld until the correct moment—a procedure which is easy to perfect, given the proper degree of co-operation between anaesthetist and obstetrician.

Breech Extraction

In this type of breech delivery the need for a rapid induction is no longer present, while good relaxation of the uterus and of the muscles of the perineal floor is essential if trauma is to be avoided (Potter, 1922; Piper and Bachman, 1929; Greig, 1945; Gustafson, 1949). This in effect means that a sufficiently deep ether anaesthesia must be given, since the use of the only other uterine relaxant—namely, chloroform—is unjustifiable in hospital practice. It might be thought that the degree of foetal narcosis thus produced would be hazardous, but in any event this is preferable to trauma, and in practice seldom gives rise to anxiety.

Drugs such as thiopentone, cyclopropane, and curare are on the whole unsuited to the procedure under consideration, since, although they may or may not produce a rise of uterine tone, they certainly do not relax the uterus.

On the other hand, a spinal or extradural anaesthetic given to a height sufficient to abolish uterine sensation does cause a considerably "heightened reactivity" to stimuli of the uterus (Malpas, 1944; Lull and Hingson, 1948). As a result not only is the risk of trauma both to the foetus and to the mother greatly increased, but, in addition, foetal anoxia may arise owing to placental ischaemia. This form of anaesthesia is therefore entirely contraindicated in breech extraction.

Considerations with Regard to the Third Stage.—A possible argument against the use of ether in breech extraction is that the resultant lowering of uterine tone might predispose to serious post-partum haemorrhage. It is probable, however, that this complication has been over-emphasized in the past; certainly in our experience it has rarely been observed. This may be due to the fact that it has always been our policy to give 0.5 mg. of ergometrine intravenously following the birth of the head. At all events, the danger of a contracted uterus during breech extraction would seem considerably to outweigh that of a relaxed uterus after delivery has been completed.

Summary

Assisted breech delivery and breech extraction are two very distinct obstetric operations requiring different anaesthetic techniques.

The special considerations involved in anaesthesia for such deliveries have been reviewed.

In assisted breech delivery it is recommended that a perineotomy be performed under local infiltration analgesia, inhalation anaesthesia being limited to the delivery of the arms and head.

In breech extraction a high degree of uterine relaxation is necessary. For this reason a deep ether anaesthetic is the only one which may justifiably be employed.

Spinal or extradural anaesthetics are not the most suitable for assisted breech deliveries and are absolutely contraindicated in breech extraction.

Close co-operation between obstetrician and anaesthetist is essential if the best results are to be obtained in this branch of obstetrics.

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Conservancy Systems at Collieries is the title of a medical memorandum recently issued by the National Coal Board. It is intended as a general guide for colliery managers. After stating the legal requirements, the memorandum describes various installations for use above or below ground. The standard of sanitation in mines is, not surprisingly, below that in other industries. Both health and morale would benefit if it were improved.

DANGERS OF POLYPHARMACEUTICAL PREPARATIONS CONTAINING FOLIC ACID

BY

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The inclusion of folic acid in proprietary preparations was deplored by Davidson (1948), but, as can be seen from the examination of recent advertising matter, the practice continues. The purpose of this note is to draw attention to the difficulties which may arise when anti-anaemia treatment is undertaken without proper investigation of the case and with preparations of the "blunderbuss" type.

Case Report

A 46-year-old housewife first complained of stiffness of her knees in October, 1952. Treatment with short-wave diathermy was given after she had attended orthopaedic and medical dispensaries. In January, 1953, she developed a short febrile illness associated with vomiting, anorexia, and loss of weight, from which she did not fully recover. In February, at another medical dispensary, no abnormality was found on examination, with the exception of a haemoglobin level of 48% (Sahli). A course of iron was recommended, and the patient was requested to attend for further investigations. Her family doctor gave her a proprietary preparation of iron, and her general condition improved greatly. Her appetite returned to normal and her weight increased, but the stiffness of her legs began to worsen rapidly. She did not return for investigation, but in May, 1953, she fell and was admitted to hospital for treatment of an infected haematoma. After 10 days in bed she was found to be unable to rise or walk, and was transferred to a medical ward for investigation.

On examination the patient was found to have a spastic paraplegia with great muscular weakness, bilateral extensor plantar responses, and complete loss of posterior column sensation in both legs. There was no upset of the function of bladder or bowels. Histamine-fast achlorhydria was demonstrated. Blood examination showed: haemoglobin, 12.3 g.%; red cells, 3,600,000 per c.mm.; white cells, 8,000 per c.mm.; P.C.V., 38%; M.C.V., 105.6 μ^3 ; M.C.H.C., 32.1%. Sternal marrow biopsy showed appearances suggesting a partially treated anaemia resulting from deficiency of the haemopoietic principle. Lumbar puncture and radio-scopic of the lumbar spine showed no abnormality.

A diagnosis of subacute combined degeneration of the cord was made, and treatment with "anahaemin" and vitamin B₁₂ was started (4 ml. of anahaemin on alternate days, and 100 μ g. of "cytamen" daily). Haematological and neurological improvement was rapid, and five weeks later the patient was walking well enough to continue treatment as an out-patient. When last seen she had only very slight ataxia, and examination of the blood and marrow showed normal appearances.

It was found that she had been treated originally with capsules containing iron, vitamin B, extract of raw liver, and folic acid. The amount of folic acid present in each capsule was 1 mg., and she had consumed 3 mg. of folic acid daily for 38 days.

Discussion

The literature on the results of treatment of cases of Addisonian anaemia with folic acid was reviewed by Davidson (1948) and by Israëls and Wilkinson (1949). These authors concluded that folic acid had no place in the treatment of pernicious anaemia. The haematological state not