between paralysis of the right shoulder-girdle and of the left leg, the latter occurring after the temperature had returned to normal—rather an unusual occurrence. The tendon reflexes are usually absent or greatly diminished in this phase and the paralysis is flaccid.

Many varieties of history, signs, and symptoms are seen in different individuals, and the encephalitic form may justifiably be regarded as a tuberculous or other type of meningitis, unless facilities exist for examination of the cerebrospinal fluid.

Cerebrospinal Fever

During the war most practitioners have had a fairly large experience of cerebrospinal fever, but nevertheless it is interesting to consider the diseases which at first sight were thought to be meningococcal meningitis. Some of these were indistinguishable from cerebrospinal fever on clinical grounds alone, and out of 140 cases notified there was an 18% error, much reduced if other types of meningitis are excluded. Sixteen such cases occurred—9 tuberculous meningitis, 4 benign lymphocytic meningitis, 1 pneumococcal, 1 streptococcal, and 1 syphilitic meningitis. Again some confusion has arisen in various chest conditions, mostly in children, presenting signs of meningism: two cases of lobar pneumonia, one of bronchopneumonia, and one of spontaneous pneumothorax were wrongly thought to be cerebrospinal fever, although the last-mentioned case presented very few signs or symptoms referable to meningitis. Among the miscellaneous conditions seen were transverse myelitis, aneurysm of the middle cerebral artery, and one case each of measles, rubella, and scarlet fever.

It is impossible to differentiate with certainty the various forms of meningitis clinically before submitting a specimen of the cerebrospinal fluid to the laboratory, but in all the cases which subsequently turned out to be of tuberculous origin there was a history of gradual onset, a vague prodromal period of ill-health, or a history of some chest trouble which gave a pointer to the possible origin of the trouble.

Pneumonia in children may simulate meningitis very closely. The sudden onset, the signs of meningeal irritation, the high temperature, and perhaps paucity of physical signs in the chest are all misleading.

The measles and scarlet fever cases were probably sent in through the mistaken view that the rash was that of meningococcal meningitis, but there were no other signs to suggest a meningeal lesion. The patient with rubella was sent in because she complained of a stiff neck. This particular symptom sometimes occurs several days before the rash appears, and may well give rise to some doubts when cases of the more serious disease are prevalent.

Miscellaneous

I have mentioned the commoner infectious diseases; there are others, and combinations of the various infections, which I could include, such as bronchitis, frequently sent in as whooping-cough, erysipelas, which has been confused with eczema, carbuncle, dacryocystitis, herpes zoster, and cavernous sinus thrombosis; but of all the mixture of odd infections the most frequent mistake is the case labelled "measles and bronchopneumonia." Perhaps, however, this mistake may be a matter of expediency rather than a lack of clinical acumen. Ordinarily, cases of uncomplicated measles are not admitted; but attach the magic word "bronchopneumonia" and a bed is found somewhere!

In spite of this there are a great number of honest errors of judgment, and I think the reason is probably that the doctor is called in either just as the rash is appearing or when it is just fully developed, so that the child is restless and looks ill. At this stage the fever is considerable—the temperature commonly elevated to 103–104°, there is considerable catarrh in the chest, the respirations are frequent and short, and there is nearly always a dry cough. The physical signs in the chest at this stage are those of a mild bronchitis, but the whole picture looks at first sight rather like a bronchopneumonia. Very soon, within 24 to 36 hours, the rash begins to fade, the symptoms abate, and the temperature drops, and it is during the next few days that true bronchopneumonia is likely to develop. It is only exceptionally that pneumonia occurs in the prodromal stage or coincidentally at the time of eruption.

I have tried, so far as is possible, to avoid figures in this paper, nor do I wish to imply any criticism of other doctors' work. I am sure there would be ample material for another paper based on my own personal mistakes. Anyhow, it will show that life in a fever hospital is not so dull, that it does not consist entirely in looking after cases of scarlet fever, and that good clinical work can still be found in this branch of medicine—despite the war and the forms!

I have to thank Dr. T. Peirson, medical officer of health, City of Plymouth, for permission to publish this paper. I should also like to acknowledge the help I have obtained from the standard works on infectious disease for reference on doubtful points, particularly *Harries and Mitman* and my old chief's book, *Rolleston and Ronaldson*. Few who have worked under Dr. J. D. Rolleston could fail to be stimulated by his magnificent teaching on the infectious fevers.

GASTRO-INTESTINAL BLEEDING DUE TO VITAMIN K DEFICIENCY COMPLICATING LABOUR

BY

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In 1929–33 a haemorrhagic chick disease was observed in a number of laboratories (Brinkhous, 1940), in most cases incidental to experiments in which chicks were fed purified diets low in fats. During observations on the effect of various proteins on the growth of chicks spontaneous haemorrhages were noticed. Administration of lemon juice, ascorbic acid, cod-liver oil, and wheat-germ oil failed to prevent these haemorrhages in chicks fed on the purified diets. It was suggested by Dam, in 1934, that this condition constituted a new dietary deficiency disease, and his suggestion that the deficient factor be called vitamin K has been adopted. These diets were low in fats, and McFarlane, Lane, and Richardson gave evidence of the fat-soluble nature of the vitamin: they noted that fish meal prevented haemorrhage unless it had been extracted by ether.

Haemorrhagic chick disease was recognized as being due to deficiency, and the relationship of this dietary factor to blood clotting was established. A low plasma prothrombin was suspected: a haemorrhagic tendency appeared when the low prothrombin levels were reached when feeding chicks on K-deficient diets for several days. Both the low prothrombin and the haemorrhagic tendency were cured by feeding vitamin K.

That mammals may develop such a deficiency was shown in conditions in which the absorption of this fat-soluble vitamin is hindered by absence of bile in the intestine. Hypo-thrombinaemia and haemorrhage ensued, and were cured by the administration of vitamin K. Vitamin K occurs richly in alfalfa, spinach, cabbage, cauliflower, carrot-tops, and soya beans; it is less potent in tomatoes and orange peel. There is a little in liver and egg yolk.

The causes of vitamin K deficiency are deficient diet, obstructive jaundice, and biliary fistula leading to absence of bile in the intestine. Haemorrhagic disease of the newborn shows a low prothrombin level and is controlled by vitamin K. Jaundice appears to have no relation to the deficiency. Haemorrhage due to low plasma prothrombin may occur in ulcerative colitis, intestinal obstruction, and fistulae.

Attention is directed to a most complete and excellent review of the literature on plasma prothrombin and its relationship to vitamin K by Brinkhous (1940).

In view of the above facts it may be interesting to record a recent case of mine treated with vitamin K.

Case Report

A farmer's wife was taken ill in Sept., 1943, with acute pain in the back and vomiting. Her temperature varied from 100° to 103° for four days. She was diffusely tender over the abdomen, but no definite localizing signs were obtainable. Her condition becoming worse on the evening of the fourth day, I sent her into hospital, twelve miles distant. The urine showed no abnormalities up to that time. In hospital her case was diagnosed as a simple catarrhal jaundice, and bile appeared in the urine. A blood count revealed

2,500 white cells, but otherwise was normal. Her last menstrual period was Aug. 18, and she thought she was pregnant; her only child was then 6 years old. She returned home in eleven days; she looked ill and vomited more or less severely for about ten weeks. The Aschheim-Zondek test was positive. During this time she had a slight discharge of blood from the vagina, and was given wheat-germ oil. A polypus was found on examination; this was removed in December. All through her pregnancy she continued to have a tendency to vomit occasionally. At the start of her illness she took nothing but glucose and water, and after one week honey, tea with sugar and skimmed milk, and a little bread. On her return home her diet consisted of carbohydrates in the form of glucose, bread, jelly, and marmalade, and proteins in the form of meat and chicken. She also ate baked apples and vegetables, but no butter or eggs. Gradually butter and full-cream milk were introduced, and lastly eggs in four weeks' time. By the sixth week she was on normal diet. She spent the last three weeks of her pregnancy in bed because of lassitude and severe cramping pains in both groins and in the rectum. The spleen was never palpable. The patient's husband developed jaundice one month after her return from the hospital, and her sister and niece two and three months later, respectively.

At term on May 18, 1944, at 10 a.m., after a slow labour, she was delivered spontaneously of a normal live male infant (10 lb. 14 oz.). Placenta and membranes, intact, were expressed half an hour later. An old perineal scar reopened, and was repaired under local analgesia (two internal and three external sutures). At 10.45 a.m. she bled freely per rectum. Pituitrin 1 c.cm., morphine gr. 1/4, and routine treatment for shock followed hot vaginal and rectal lavage. There was no rectal tear. Pituitrin was repeated during the afternoon. Plain and glucose water were given freely by mouth. At 3.50 p.m. she vomited first clear then blood-stained fluid (approximately 60 c.cm.). Her general condition was improving. Morphine was repeated at 5 p.m. and vitamin K 10 mg. (prokayvit B.D.H.) was administered intramuscularly into the buttock. The patient bled no more, and made a good recovery. The next day prokayvit 5 mg. was injected intramuscularly. Rectal saline was given; this returned blood-stained and was not repeated. She was put on liquid paraffin t.i.d. On the sixth day after delivery she passed a melaena, after that normal stools. On June 2 a pathologist reported as follows:

Pathological Report 1.—Blood count: Hb, 59%; R.B.C., 3,310,000 per c.mm.; platelets, 236,000 per c.mm.; colour index, 0.89; leucocytes, 3,800 per c.mm.—polymorphs 74%, lymphocytes 26%. Fair numbers of reticulocytes present. The red cells show slight anisocytosis. Blood urea, 25 mg. per 100 c.cm. Blood fragility: Haemolysis starts in 0.36% and is complete in 0.30% saline. There is no increase in the fragility of the red cells. Urine: S.G., 1010; pH, 6.8; no albumin, no sugar; urea, 0.82%; fair numbers of red cells, a few pus cells, no casts seen. Fair numbers of coliform bacilli seen in fresh smears. Culture: A very large growth of coliform bacilli obtained. Van den Bergh reaction: Completely negative, both direct and indirect. Blood bicarbonate: 64.3 c.cm. CO₂ bound by 100 c.cm. plasma at N.T.P. Prothrombin clotting time: 39 secs. (control, 25 secs.); definitely prolonged.

On June 5 the patient was given 5 mg. of prokayvit intramuscularly, which was repeated on June 6, when she left our infirmary. She visited the laboratory on June 7, and the following report was issued:

Pathological Report 2.—Blood count: Hb, 70%, R.B.C., 3,836,000 per c.mm.; colour index, 0.92; leucocytes, 6,250 per c.mm.—polymorphs, 69%, lymphocytes 27%, monocytes 1%, eosinophils 3%. An occasional reticulocyte present. No abnormal white cells seen. Platelets abundant. Prothrombin index: June 5, 67%; June 8, 111%.

It should be noted that the patient received the first vitamin K injection on May 18, the second injection on May 19. On June 2 the first prothrombin index was determined, and was found to be 67% of normal (100% = 25 secs.). On June 5 the third vitamin K injection was given, and this was repeated on June 6; on June 8 the second prothrombin index was determined, and was found to be 111%. The first and second administrations of vitamin K were therapeutic, the third and fourth experimental, to detect a rise in the prothrombin index.

A hippuric acid excretion test has since been made, with the following results. No other liver function tests were available.

Time	Urine Collected	Specific Gravity	Hippuric Acid Excreted
9.30 a.m. . .	200 c.cm.	1006	0.25 g.
10.30 a.m. . .	173 c.cm.	1012	0.05 g.
11.30 a.m. . .	153 c.cm.	1011	0.07 g.
12.30 p.m. . .	102 c.cm.	1010	0.08 g.

In a follow-up pathological examination, dated Sept. 7, the prothrombin index was found to be 85% of normal; the total hippuric acid 6.26 g. (normal about 5 g.).

The amount of hippuric acid excreted by normal individuals is approximately ten times the amount recovered from this patient. The hippuric acid test suggested that some degree of liver damage was present, although, clinically, there were no objective signs to indicate liver dysfunction. As Andrus and Lord (1942) have shown, patients with parenchymal liver damage of severe degree do not respond to vitamin K, and hypoprothrombinaemia persists in such subjects. Sweet, Lucia, and Aggeler (1942) showed that the hippuric acid test is a more delicate index of liver function than prothrombin concentration, although the latter detects destruction of liver parenchyma as well.

Commentary

It is probable that the bleeding manifested by this patient was due to vitamin K dietetic deficiency in the first two months of gestation, inasmuch as she subsisted on a fat-free diet during most of that time and only gradually resumed ingestion of fats during a rather prolonged convalescent period.

That the haemorrhagic tendency resulted from vitamin K deficiency is supported by the marked rise in prothrombin index from 67% to 111% after the second two injections of the vitamin; in addition, the clinical recovery of the patient after the initial administration of the vitamin corroborates most substantially this point of view.

A lapse of 15 days took place between the therapeutic and the experimental administration of vitamin K, and the prothrombin index at the onset of labour might have been very much lower than when first estimated. The results of the hippuric acid excretion test indicate impairment of liver function, although to establish this beyond doubt would require further laboratory studies, which, unfortunately, could not be carried out because of the lack of such facilities, and because of the difficulty of transporting a non-ambulant patient for such studies. That the prothrombin level rose so much after the experimental administration of vitamin K indicated very strongly a pre-existing deficiency in that factor. Another factor to be considered is the hydraemia of pregnancy, which, by its occurrence as a physiological concomitant feature, may reduce a borderline prothrombin content to a lowered one, particularly if the diet, as in this case, be deficient in vitamin K. In such a patient post-partum haemorrhage from the placental site would prove an even more serious complication of labour, particularly if the possibility of a vitamin K deficiency either was unknown because of an inadequate neonatal history or was overlooked.

Summary and Conclusions

The case history of a patient developing gastro-intestinal bleeding during the last stage of labour and early puerperium is recorded, with evidence supporting the view that the haemorrhagic tendency resulted from a lowered blood prothrombin level; clinical recovery followed the administration of vitamin K.

Pregnant women who have suffered from an obstructive jaundice and consequent dietary deficiency in fats would benefit by having a prothrombin index taken before the onset of labour, so that vitamin K administration may be instituted, if necessary, to prevent a haemorrhagic tendency from developing as a result of hypoprothrombinaemia.

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