100 ml.), but these two groups are not strictly comparable, since the folic acid cases were usually more anaemic before treatment and could not be observed over preliminary control periods. The addition of folic acid to treatment did not seem to alter the subsequent course in two of the trial cases, while in four others who were followed long enough blood counts reached normal values on vitamin B₁₂ (with added iron in two).

Very poor results followed treatment with vitamin B₁₂ in all three cases seen during pregnancy. From Table I it is seen that total proteins and serum albumin levels were lowest in these three cases, so that, besides pregnancy, protein malnutrition might be a factor inhibiting response to treatment. This seems unlikely from my experience with folic acid series. In six cases, four treated with folic acid at term and two post partum, serum albumin was less than 3 g. per 100 ml. (range 1.6 to 2.8 g.), and in three of these the total protein was less than 6 g.; yet five responded well, including one with only 4.9 g. total protein and 2.5 g. albumin.

A similar distinction between cases treated before and after delivery is found by analysing the details of the trial reported by Moore *et al.* Ten of their 12 post-partum cases responded to the large doses they used, but in some there were only small increments in Hb in the first two weeks. Only three out of their five ante-partum cases responded to vitamin B₁₂, and in all three the average daily Hb rises were very low. On the other hand, seven of Berry's nine cases treated during pregnancy responded to vitamin B₁₂, although normal Hb levels were not reached. Like Das Gupta *et al.* (1953), who treated nutritional macrocytic anaemia with vitamin B₁₂, Berry believes that additional folic acid may be necessary for complete remission. Foy *et al.* (1955) suggest that there are two types of non-pernicious megaloblastic anaemias in Africans—classified on response to treatment—including cases seen in pregnancy. One type responds completely to penicillin (in specified doses) or to vitamin B₁₂ by mouth, and serum vitamin B₁₂ levels are very low before treatment. The other (with normal serum vitamin B₁₂ levels) responds to folic acid but not to penicillin or vitamin B₁₂.

In Durban the bone marrow differs from that described in megaloblastic anaemia seen in temperate climates. Giant metamyelocytes are always present, but erythropoiesis may be either megaloblastic or of the intermediate variety. Similar appearances are seen elsewhere in Africa. Dacie and White, who observed red-cell precursors of intermediate type in cases of pernicious anaemia not severely anaemic, ascribed the changes to minor deficiencies in haemopoietic factors. In my cases, however, as in those of Foy *et al.* (1952a) and Berry, this intermediate type of megaloblastic change may be seen when anaemia is severe.

It seems likely that there are several varieties of megaloblastic anaemia associated with pregnancy because of these differences in the appearance of the bone marrow and in response to treatment. Despite this, however, cases reported from many parts of the world have much in common. They tend to occur in the last three months of pregnancy or in the puerperium; sometimes the onset is rapid; the peripheral blood picture is inconsistent; spontaneous remission may occur after delivery; and dietary deficiencies do not appear to be the only cause, although diets are often poor. The common factor among them all may well be the development of resistance to the action of haemopoietic substances during pregnancy, as Badenoch and his colleagues have suggested, rather than to absolute deficiencies.

Summary

The results of a clinical trial using vitamin B₁₂ in 10 patients with megaloblastic anaemia of pregnancy are recorded. The appearance of the bone marrow is briefly described.

Response was satisfactory in all seven treated after delivery. It appeared to be as good with doses of 100 µg.

as it was when 1,000 µg. or more was given, but better results are usually obtained with folic acid.

Three patients treated before delivery responded poorly.

Because of differences in the appearance of the bone marrow and in response to treatment, it seems likely that there are several varieties of megaloblastic anaemia associated with pregnancy.

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OPERATIVE PARATHYROID ARTERIOGRAPHY FOR LOCATION OF PARATHYROID TUMOUR

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The operative discovery of a parathyroid tumour which lies at a distance from the thyroid gland, and especially of a parathyroid tumour in the superior mediastinum, can still be a difficult surgical exercise, and any procedure which locates such a tumour is of advantage. It has been found possible, at least on some occasions, to outline a parathyroid tumour by passing an arterial catheter disto-proximally into the arch of the aorta so that its tip lies at the orifice of the subclavian artery and radio-opaque material injected by way of the catheter can enter that artery, and pass by the inferior thyroid trunk to the thyroid gland and parathyroid tumour; but filling of the vertebral artery by this technique may give cerebral complications (Seldinger, 1954). The parathyroid tumour is so vascular that it may be

outlined. It occurred to one of us (R.F.) that more direct arteriography might be undertaken during the operation.

Procedure

Inferior thyroid arteriography was done during the exploration of the neck of a woman who had parathyroid osteodystrophy and investigation of whom had proved that she suffered from parathyroid overaction. Clinical examination did not expose any asymmetry of the neck, a plain x-ray film of the neck and barium swallow did not demonstrate any displacement of trachea or oesophagus, and before operation the location of the parathyroid tumour was not known.

The initial steps of the operation followed the usual pattern. The patient was placed carefully on the operating-table with the shoulders symmetrically raised on a pillow and the chin pointing directly forwards. A low collar incision was made, the infrahyoid muscles were separated in the midline and transected, and the thyroid gland was exposed. Close inspection failed to reveal any asymmetry, except the normal degree of displacement of the pyramidal lobe a little to the right of the midline. As in the case of at least one previous parathyroidectomy, the thyroid gland lay at a rather higher level than usual, the upper border of the isthmus being situated slightly above the level of the cricoid cartilage. The superior thyroid vessels, which were symmetrical on the two sides, were divided as in thyroidectomy, and the middle and inferior thyroid veins were divided also. The upper and lower borders of the isthmus and the gland were defined, as also were the medial borders of the upper poles of the lateral lobes. Then, on each side, stay sutures were inserted into the lateral borders of the lateral lobes, and these were retracted while the carotid sheath was drawn laterally. Search in the areolar tissue between the thyroid gland and the carotid sheath failed to reveal a tumour, nor could a tumour be seen on close inspection of the borders of the oesophagus and the grooves between trachea and oesophagus. The fascia over the inferior thyroid artery on each side was now opened and

both inferior thyroid arteries were exposed. The right inferior thyroid artery was distinctly greater in girth than the left—a useful indication of the side of a parathyroid tumour.

It was decided to perform inferior thyroid arteriography on the right side, the side of the larger vessel. A "record" syringe containing 10 ml. of 50% diodone was connected by "polythene" tube with a hypodermic needle. The right inferior thyroid artery was elevated on a thread support at the point of its emergence from under cover of the carotid sheath, with just enough tension to stop the flow in it. The needle was then inserted into the lumen of the artery just distal to the point of its occlusion, and the radio-opaque material was rapidly injected. With the aid of a cassette placed under the patient's neck three antero-posterior films were taken, one towards the end of the injection and two immediately after the completion of the injection. They were developed and examined wet; the first of the two films is here reproduced. This shows the right lateral lobe of the thyroid gland clearly outlined by opaque material, while below it and rather lateral to it the outline of the responsible parathyroid tumour is observed.

Comment

This film shows clearly that a parathyroid tumour can be outlined by inferior thyroid arteriography. The character of the shadows suggests that if the parathyroid tumour had lain on the side of the trachea, or in the groove between the trachea and oesophagus, the shadows of the thyroid gland and parathyroid tumour would not have been separately distinguishable. A tumour in such a situation, however, should offer no great difficulty of operative dissection. It would seem that it is precisely on those occasions when the parathyroid tumour lies at a distance from the thyroid gland that it is most easily delineated radiologically. On this occasion the tumour did in fact occupy the situation in which radiology showed it to be—in the connective tissue of the neck below and lateral to the lateral thyroid lobe, and at a distance of about 2 cm. from the lower border of that lobe. Had we failed to outline the parathyroid tumour by right inferior thyroid arteriography, we should have had recourse to arteriography on the opposite side in the hope of outlining a left parathyroid tumour. If the disparity in size had been not between the inferior but between the superior thyroid arteries the larger superior thyroid vessel would have been chosen for the injection.

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Parathyroid aortography. Needle outlines trunk of inferior thyroid artery T=right lobe of thyroid gland. P=parathyroid tumour outline.

Research into "river blindness" and plans for the control of the *Simulium* flies which carry the filarial worm causing the disease (onchocerciasis) are described in the annual report of the British Empire Society for the Blind. An ophthalmic team, under Dr. F. C. Rodger, has been assessing the extent of river blindness. In the worst endemic areas of the Northern Gold Coast, among the million African inhabitants, 600,000 have onchocerciasis and at least 30,000 are blind. In some villages one-tenth of the population and one-fifth of the adult males are blind. Dr. Geoffrey Crisp, leader of the entomological team, has prepared a plan to control the fly at a cost of only £66,000. This plan, worked out with the help of the London School of Hygiene and Tropical Medicine, recommends a three-year campaign by six teams of African workers supervised by an entomologist. The report explains: "Each of these teams, using a simple routine and inexpensive equipment, would treat a section of the main endemic areas, at specified points, during the vital phases of the flies' life cycle. The total effect should be rapidly to clear some of the most heavily infected points and, over the main endemic area, gradually to reduce the number of flies to manageable proportions so they can subsequently be controlled by a permanent routine." Apart from the plans being made to prevent infestation, research has been carried out into the effect of new drugs in preventing an already infested person from going blind.