From the above it will be seen that about 80 per cent. may be regarded as cured, about 10 per cent. as improved, and about 12 per cent. as receiving little or no relief. It is interesting to compare these results with those from individual operations.

	Very Good.	Good.	Very Fair.	Fair.	Poor.
Partial gastrectomy	3	9	1	1	1
Excision with posterior gastro- enterostomy	3	—	2*	1	1
Sleeve resection	3	—	—	—	—
Posterior gastro-enterostomy—					
For gastric and pyloric ulcer ...	13	18	—	4	—
For duodenal ulcer	15	25†	5*	3	4
Total (112 cases)	37	52	8	9	6
Percentage	33	46.4	7	8	5

* One with gall-stones. † Two with gall-stones.

The good results from partial gastrectomy amount to 80 per cent.; from posterior gastro-enterostomy in gastric ulcer to 89 per cent.; in duodenal ulcer to 77 per cent.; the combined average from posterior gastro-enterostomy works out much the same as that for partial gastrectomy—that is, 80 per cent.

In this series there have been 6 cases of jejunal ulcer, which agrees with the percentage published by many other observers.

These results, if they suffer by comparison with the results published by other surgeons, are a fair criterion of the treatment which can be expected by the patients from a general hospital, in which it is impossible to cater for individual cases. Measures of improvement are easier to discern than to carry out. Patients are apt to regard operation as a panacea for their ills and a happy release from the toils of medical treatment. Being wage-earners they often have not the time to attend hospital for further advice, and the dietary indiscretions, in spite of instruction, are often alarming. An inquiry into this subject shows in a general way that pork, beef, and pastry are the main items of disagreement, and it is interesting to note that pastry and carbohydrates upset the duodenal ulcers, whereas the proteins (pork, beef, mutton, bacon, veal) disagree with the gastric ulcers. Fried and recooked foods, fruits, vegetables, condiments, cheese, eggs, cream, milk, and alcohol all appear on the list, with a slight bias against the duodenal ulcers.

I am extremely indebted to Mr. H. S. Clogg for his kindness in allowing me to publish his cases, and for his very helpful criticisms and guidance.

A CASE OF EXTENSIVE PULMONARY EMBOLISM FOLLOWING FRACTURE.

BY

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With a Note by

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THE following case appears worth recording:

Mrs. M., aged 43, was seen by one of us (V. C.-C.) suffering from a fractured left tibia and fibula (*flute en bec*), and sent into hospital, when the limb was fixed in plaster-of-Paris. She was discharged two weeks later, and the district nurse (who is not a trained masseuse) attended to massage the limb, but a doctor was not called in.

Six weeks after the accident one of us (V. C.-C.) was asked to examine the limb. Union appeared perfect and there was no shortening of the leg; there was a moderate

amount of oedema of ankle and leg to the knee, but no varicosity of the superficial veins. The ankle and knee, which were very stiff, were forcibly moved through a few degrees, and the nurse was instructed how to massage and move the limb; the patient was given permission to walk on crutches. She stated that she was being sick, but there was no discoverable cause, and she did not look ill. A sedative alkaline mixture was given, and it was reported that the sickness ceased the same day, and that the patient ate normally afterwards until the time of her death two days later.

At midday on the day of death she asked her companion not to leave her, and requested to be helped out of bed. Almost immediately afterwards she wanted to return, and had hardly been helped back when she gave a slight groan and rolled on to her right side. She then gave another groan, rolled on to her back, and expired. When seen about two hours later she was lying on her back with mouth slightly open and a peaceful expression on her face.

Post-mortem Examination.

Externally nothing abnormal was found except that the neck appeared unduly movable.

Internal examination: Cervical vertebrae normal and no fracture of cranial bones; brain and abdominal viscera normal; diaphragm contracted; lungs appeared normal, but did not fill the thorax; the heart was contracted and appeared normal.

The heart and lungs were removed and dissected out (C. W. P.). On opening the right ventricle and pulmonary artery a long clot of about the size of the lumen of the internal iliac vein was found. This had evidently folded itself so that two ends were passing into the right branch of the pulmonary artery, and two into the left, thus preventing the blood flow to the lungs and producing sudden death; the clot could not be extracted by traction. There was also a free end pointing to the pulmonary valve. The clot as it originally reached the heart must have been several inches long.

Diagram to show position of the large embolus when pulmonary artery had been opened.

Sections have been cut from the clot in the right ventricle and from clots found in the branches of the pulmonary artery near the periphery of the lungs. Dissection of the main branches of the pulmonary artery traced into each pulmonary lobe showed firm clot in many of these, particularly in the lower lobe.

Pathological Report.

The specimen was sent to Professor Ernest Glynn for further examination, and in his absence Dr. Howel Evans has kindly commented as follows:

Sections have been cut from the clot in the right ventricle and from clots found in the branches of the pulmonary artery near the periphery of the lungs.

Dissection of the main branches of the pulmonary artery traced into each pulmonary lobe showed firm clot in many of these, particularly in the lower lobe.

1. Clot from ventricle shows distinct lamination and very marked pigmentation. It is obviously *ante mortem*, and the appearances suggest that it is a few weeks old.

2. Clot from pulmonary artery, left base, shows an appearance almost identical with right. The lung is somewhat collapsed and the bronchial cartilages show slight staining with blood pigment.

3. The clot in this branch of the pulmonary artery is more recent and not laminated, but shows well-marked pigmentation. The suggestion arising from these three sections is that Nos. 1 and 2 are of some weeks' duration, but No. 3 perhaps only a few days.

The specimen raises the question of pulmonary thrombosis or pulmonary embolism. As you know, Professor Glynn has for years urged that many cases arose from primary thrombosis in the lung itself. The best evidence of embolism is to find, as may sometimes be done, a thrombus in a systemic vein which might have given off the embolus. My personal opinion is that the whole process is due to a change in the blood, and we have evidence that the most important demonstrable change is the increase in the blood platelets which occurs after operation or after fractures. This means to say that the blood might clot at any given point, and I suspect that frequently there is a contemporaneous clotting both in the lung and in a systemic

vein. The present specimen, I believe, shows this point. I cannot help thinking but that the coiled up clot in the heart came from a systemic vein, yet one finds evidence of quite definite *antemortem* clotting in branches of the pulmonary arteries.

Discussion.

The features of this case are:

1. The lack of proper massage and movement, thus favouring stasis of the blood, which many workers have shown tends towards thrombosis.¹
2. The lack of evidence of thrombo-phlebitis before the embolism occurred.
3. The length of time which the patient lived, presumably with this large foreign body thrashing about in the heart, the only symptoms being the sickness and the vague feeling of something wrong.
4. The remarkable size of the clot.

REFERENCE.

- ¹ Lister, W. A.: *Lancet*, 1927, i, 111.

SOME OBSERVATIONS ON THE ERYTHROCYTE.

WITH SPECIAL REFERENCE TO PUNCTATE BASOPHILIA, DIFFUSE POLYCHROMASIA, AND RETICULATION.

BY

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FROM the time that Ehrlich (1885) noted the three distinct basophilic conditions in erythrocytes controversies have waged on their character and significance; but for many years the trend of opinion has been towards the view that punctate basophilia, diffuse polychromasia, and reticulation are expressions of the same process.

Cesaris-Demel (1907) concluded that punctate basophilia and reticulation were identical, and Key (1921) agreed that the basophilic substance in the three conditions was the same. Brookfield (1928) believes that the stippled cells in lead poisoning are immature cells (reticulocytes and polychromatic cells) altered by the toxic action of lead. His

FIG. 1.—Erythrocytes showing spongioplasm after the lipid membrane has been altered or dissolved. ($\times 1,000$.)

results tend to confirm the work of Hawes (1909) and Key (1924), in which the close numerical relationship between stippled and polychromatic cells and reticulocytes was definitely established.

The nature of the staining substance is still undetermined, nor has any explanation been offered as to why the different appearances occur. Pappenheim (1907) and Biondi (1908) independently propounded the view that the stainable substance was a dye-precipitate upon the surface of the lipid membrane, but, later, Pappenheim (1919) rather altered this idea, and suggested that the lipid component of the spongioplasm was the reacting substance.

That the substance is not chromatinic is beyond doubt. The staining reaction with methylene blue-eosin preparations and with methyl green-pyromin, and the fact that

none of the conditions is visible by dark-ground illumination or ultra-violet light, are among the arguments against punctate basophilia, polychromasia, and reticulation being nuclear in origin.

Gruner (1913) suggested that the reticular substance was not nuclear but plasmatic in character, because in embryos and young animals its abundance was not associated with the appearances of changes in the nucleus. I have confirmed this observation in cases of Addison's anaemia during normoblastic crises, in von Jaksch's anaemia, and in myeloid leukaemia. In these diseases there does not appear to be any relationship between the younger normoblasts and the older normoblasts and the amount of reticular substance.

The present work is an attempt to elucidate these problems. The fact that haemoglobin gives a characteristic reaction with benzidine and hydrogen peroxide was utilized to the exclusion of all other stains. Blood films were made on 3×1 microscope slides and allowed to dry in the air before treatment. By altering the quantities of the reagents* it is possible to disturb the apparent homogeneity of the erythrocyte. For the better appreciation of the early effects we will take the final results first. Fig. 1 is a photomicrograph of erythrocytes from which the haemoglobin has been more or less completely discharged. Benzidine in alcohol and hydrogen peroxide were used in such strengths that when flooded on to the film a greenish precipitate was immediately produced and floated to the surface; the reaction was allowed to continue for twenty minutes. If the corpuscles in the figure are examined with a hand lens an irregular meshwork is seen, and the spaces between the strands have the appearance of pores. The outline of the cells is irregular, but the mean diameter is increased. The probable sequence of events is that the lipid membrane has been oxidized and dissolved, and a slow fixation has brought into evidence a spongy stroma through the interstices of which the reagents have penetrated. Reaction between the benzidine and hydrogen peroxide and haemoglobin has taken place with solution and escape of the end-product. Having seen the end-result, all kinds of patterns, depending upon the varying degrees of penetration of the envelope and the amount of haemoglobin

FIG. 2.—Erythrocytes showing finely granular punctate basophilia. ($\times 1,000$.)

released, would appear possible. This is, in fact, true. Every type of punctate basophilia and reticulation may be duplicated.

Fig. 2 is an example of punctate basophilia of the fine type. If the cells are examined with a lens it will be apparent that the reaction has not progressed to the stage of Fig. 1. There are areas in which the granules are sharply defined; in others, however, they are blurred in outline, suggesting that the haemoglobin has been reached but different stages of the reaction have taken place. The granules may be fine as in this figure, or coarse as in some of the cells in Fig. 4, or they may be irregular in shape and aggregated into small clusters as in Fig. 3.

At a further stage the haemoglobin has escaped through

* The reagents are benzidine 0.01 per cent. in 80 per cent. alcohol, and hydrogen peroxide.