the testing of central and peripheral vision—the color sense and minimal light sense. The majority of pupillary reactions and reflexes are not sufficiently constant to be more than suggestive. A number of reflex dilatations or pain reactions have been described, due to thermic and physical irritation of the skin, the conjunctiva and the cornea. Others mention fear, pain, crying, etc., as psychical examples. Haab calls attention to a psychical reaction due to suggestion of light.

Since receiving the reprint of this paper I have observed 100 cases of acknowledged blood pressure. The ages ranged from 40 to 70 years and the blood pressure averaged 180. In 65 cases the pupils were larger than average pupils of this age. In but 54 cases could I demonstrate the high blood-pressure reaction which has been described. On the other hand, I examined the pupils of 100 people ranging from 40 to 70 years of age who had apparently normal blood pressure for their time of life. It is interesting to note that here also numerous cases presented with larger than normal pupils, namely, 29 per cent. In 12 per cent. the higher blood-pressure reaction could be demonstrated. This gave a difference of 36 per cent. having larger pupils, in favor of those having high blood pressure. Also 42 per cent. more gave the high blood-pressure reaction than there were without it. While this shows some value of the symptom, it was by no means constant or nearly so.

The method of examining the pupillary reactions is of importance. I note that the authors do not state their procedure. The refraction of the eye somewhat determines the pupillary reaction. Our cases were examined in a dark room having but one source of illumination, namely, an electric lamp, and the patients sat at a uniform distance and were told to fix the light steadily. The observer repeated the tests six times on each patient so as to get an average and reduce to a minimum the psychic dilatation of fatigue, fright, etc., described by the authors. It is likely that different methods of examination will bring out discrepancies.

DR. EDWARD JACKSON, Denver: After reading Dr. Wiener's paper I looked for the sign in the few cases of high blood pressure encountered and found it in about two-thirds of them. The reaction, I took it, might be to some extent an indication of the lack of endurance, similar to the quick contraction and then quick and rather marked redilatation seen in asthenic conditions, the pupil soon returning to its original size. The authors of the paper have not attempted any explanation, but it occurs to me that the large pupil might be associated with changes in the vessel walls of the iris. If that is the case it may be the sign of arteriosclerosis, a point of value. The vascular lesions seen with the ophthalmoscope are found to be of more importance than the readings of the sphygmomanometer. The upper limit of normal blood pressure is often put too low. I use the rough rule of adding 100 to the patient's age as the probable upper normal limit of blood pressure. But high blood pressure shown by the sphygmomanometer is not regarded by me as of the greatest importance. Changes in the retinal vessels are more to be depended on. Changes in the vessels of the iris as indicated by this sign may have the same significance and value as those seen in the retina.

DR. MEYER WIENER, St. Louis: Regarding our method of examining the pupils, in reply to Dr. Franklin's questions, the tests were always made in a dark room, except in hospital cases. The light was thrown in from a mirror from first one side and then the other, from every direction. We always tried to eliminate the accommodation as far as possible. As to the effect of fatigue on pupillary reaction when light is thrown into the eye a given number of times, each time the pupil reacts more slowly and must be allowed to rest after the test is repeated a number of times. In hospital wards we generally have used a small electric light and flashed that in the eyes we were testing, also eliminating accommodation. The association of high blood pressure with pupillary reaction has been given special attention in the medical department of Washington University, and they have found that very regularly the enlarged pupils were associated with

high blood pressure. The cause may be due to the holding power of the iris, or possibly due to the increased amount of adrenal principle in the blood. This was suggested to me by Dr. Dock of Washington University, and we expect to experiment along this line in the future. Dr. Franklin, however, has not found the two symptoms associated nearly as constantly as we have found them. Possibly the reason is that his tests were made with a fixed light; otherwise he has not eliminated the accommodating power, if I understand it rightly.

IMMEDIATE RESULTS OF SPLENECTOMY IN PERNICIOUS ANEMIA*

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AND

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Recently splenectomy has been advocated as a therapeutic procedure in pernicious anemia. Eppinger,¹ Moffitt,² von Decastello³ and others have discussed the theoretical and experimental evidence for the assumption that the etiologic factor of pernicious anemia resides in the spleen. Isolated case reports of splenectomy in pernicious anemia have appeared in the American and English literature.

We desire to present five out of seven cases of typical pernicious anemia which were admitted to the West Medical Service during a period of approximately two months, extending from Nov. 12, 1914, to Jan. 9, 1915. Of the two cases in which operation was not performed, one patient was moribund at admission and died in three days, in spite of transfusion. The second was in very poor condition with a red count of 500,000, and died before a donor could be procured for transfusion. Thus it can be fairly said that the series of cases in which operation was performed was in no way a selected one.

The remaining five patients operated on were all men between the ages of 31 and 54 years showing varying grades of anemia. In two cases the anemia was so great that transfusion was performed before splenectomy. With one exception they had been able to do very little or no work for a year or more.

It was carefully explained to each patient that splenectomy in pernicious anemia was an experimental procedure. No definite hope of cure was offered. The operation was not urged. It can be fairly stated that the patients accepted operation with full appreciation of its danger and of our lack of definite information as to its ultimate result.

A brief history of each case will be given, together with the blood findings and other laboratory data both before and after operation.

CASE 1.—*History*.—L. N. H. (Hospital No. 198641), man, aged 43, entered the hospital for the second time Nov. 12, 1914. Family and past histories were essentially negative. The present illness began two and a half years ago, during which time he has had six attacks of pallor, weakness and dyspnea lasting from two to three months and followed by definite remissions. The attacks have become increasingly severe, and the last one was accompanied by diarrhea. The patient was in the hospital during the fourth attack, at which

* From the West Medical Service, Massachusetts General Hospital, Dr. Richard C. Cabot, Chief of Service.

1. Eppinger, H.: *Berl. klin. Wchnschr.*, 1913, 1, 1509.

2. Moffitt, H. C.: *Am. Jour. Med. Sc.*, 1914, clxxv, 817.

3. Von Decastello, A.: *Deutsch. med. Wchnschr.*, 1914, xl, 692.

time he had a red count of 852,000, hemoglobin was 25 per cent. and the spleen was palpable. Previous treatment had consisted in Fowler's solution over a period of months, also one dose of salvarsan intravenously two months ago.

Physical examination in this, his sixth attack, was negative except for lemon-yellowish tint to skin and blood. Red count, 2,525,000; hemoglobin, 60 per cent.; white count, 5,000; neutrophils, 65 per cent.; basophils, 29 per cent.; eosinophils, 3.5 per cent.; mast cells, 2.5 per cent. The red cells showed much variation in size and shape, good color, some polychromatophilia, no blasts, platelets somewhat decreased in number. Resistance of red cells to salt solution; beginning hemolysis at 0.475 per cent., complete hemolysis at 0.30 per cent. sodium chlorid. Urobilin in stools increased. Wassermann negative.

Operation and Result.—Splenectomy was performed by Dr. Vincent, November 25. November 26, the white count was 26,400. This gradually came down to 14,000 by December 3. November 27, the blood picture showed 5 per cent. normoblasts and 2 per cent. megaloblasts (per hundred leukocytes), which increased in number for several days and then gradually diminished. Howell-Jolly bodies appeared at the same time as the blasts and persisted till discharge. The reticulated cells were not increased in number—less than 1 per cent. The platelets began to increase at the end of a week and were present in large numbers. The red count had not changed when the patient left the ward three weeks after operation, but the hemoglobin had increased to 75 per cent. and the red cells showed much less variation in size and shape. There was a white count of 8,200 with a 10 per cent. eosinophilia; neutrophils and basophils were in the same relative proportion as before. The urobilin in the stools had dropped to normal. Resistance of red cells two weeks after operation, 0.55 to 0.25. The patient felt much stronger, but weighed 13 pounds less than at entrance. Two and a half months later his physician reported that his red count was 4,000,000 and he had gained 30 pounds.

March 11, three and a half months later, he was seen; the red count was 5,028,000; white count, 9,600; no eosinophilia; hemoglobin, 80 per cent. The red cells showed a good color; the average cell was definitely larger than normal; there were many macrocytes and an occasional microcyte and poikilocyte. Howell-Jolly bodies were present in large numbers and platelets were increased over normal; there was no polychromatophilia; resistance of red cells, 0.525 to 0.25.

While he looked and seemed well and his actual blood counts were essentially within normal limits, yet he still presented an abnormal blood, not only in regard to the presence of Howell-Jolly bodies, but also in the microscopic appearance of the red cells. There was no marked distortion of the red corpuscles, yet their general appearance, large size, etc., was fairly typical of the appearance of the red corpuscles in primary pernicious anemia.

CASE 2.—History.—F. L. M. (Hospital No. 198718), man, aged 54, entered the hospital for the second time, Nov. 16, 1915. Family and past histories were negative. The present illness began three years ago, since when he has had two other attacks at yearly intervals, each lasting longer than the preceding one. The first two were followed by remissions. He is still suffering from the third attack, which began six months ago. There has been numbness of the hands and feet recently and a loss of 10 pounds in the past year. No gastro-intestinal symptoms except pain in epigastrium. No systematic course of treatment was followed.

Physical examination shows the characteristic coloring of the skin, a palpable spleen and marked edema of lower legs. Visceral examination negative. Blood, red count, 736,000; hemoglobin, 15 per cent.; white count, 3,000; neutrophils, 70 per cent.; basophils, 30 per cent. The red blood cells show marked variation in size and shape, polychromatophilia, no blasts, and diminished platelets. Resistance of red cells, 0.475 to 0.30. Wassermann negative. The urobilin in stools was high. He grew rapidly worse, becoming edematous and drowsy. The red count dropped to 574,000 and hemoglobin to 12 per cent. November 22, he was trans-

fused, receiving 600 c.c. of blood. Immediately after transfusion the red count was 1,600,000, hemoglobin 50 per cent., and the blood showed many normoblasts, which persisted for two days and then disappeared. Within six days after transfusion, the red cells had reached 3,164,000, hemoglobin 60 per cent., the platelets increased to about normal. The patient improved much symptomatically. December 7, he had a sudden attack of generalized convulsions followed by coma lasting from six to eight hours, for which no cause could be found. This cleared up rapidly. By December 22 his red blood count was about 3,000,000; platelets had become much diminished and he was still in bed and quite weak.

Operation and Result.—Splenectomy was performed by Dr. Vincent; the next day the white count was 24,400; an occasional normoblast and Howell-Jolly body appeared. The reticulated cells were not increased. By the end of a week the Howell-Jolly bodies and platelets were present in large numbers, but the blasts had disappeared and the white count had fallen to 11,000. The red count showed very little change till the fifth week, when it rose to 4,160,000. However, this rise was followed by a drop during the next three weeks to 2,600,000, when the patient left the ward. In spite of this drop the quality of the blood had improved much as the red cells showed little variation in shape and much less in size than before splenectomy. Macrocytes were still frequent and Howell-Jolly bodies persisted. The hemoglobin remained at 60 per cent. and the urobilin in the stools dropped to normal and the resistance of the red cells at the time of discharge—eight weeks after splenectomy—was 0.70 to 0.225. The patient's convalescence was a rather stormy one. On the tenth day after the operation, from which he suffered very little shock, a severe diarrhea began, and within a few days he was passing pus and blood. This condition persisted for three weeks and was followed by a phlebitis, first of the left leg and later of the right. However, by the end of two months he was able to leave the hospital, feeling much better than at entrance, but weighing less. March 21, almost three months after splenectomy, the patient reported. His red count was 4,168,000; hemoglobin, 75 per cent.; white count, 15,400; lymphocytes, 64 per cent.; polynuclear leukocytes, 36 per cent. He was feeling better than at any time for several years and had gained 13 pounds since discharge. Two weeks later he was seen again and was still gaining weight. At this time the red count was 3,968,000; hemoglobin, 73 per cent. The red cells showed some variation in shape with an occasional poikilocyte and much variation in size; macrocytes were frequent. Color of cells, good; frequent polychromatophilia; blasts and Howell-Jolly bodies numerous and the platelets increased. Reticulated reds, 1 to 2 per cent.; fragility, 0.60 to 0.25. Urobilin in the stool was found to be still increased in amount although not so high as before splenectomy.

CASE 3.—History.—H. E. B. (Hospital No. 189666), man, aged 31, entered the hospital for the second time Dec. 21, 1914. Family history was negative. For several years preceding the present illness he has had periods of vomiting, abdominal distress and diarrhea every summer, accompanied by slight pallor. The first severe attack in the present illness occurred one and a half years ago, on which occasion he entered the hospital for the first time. Since then he has had two more attacks, each one of greater severity than the last and the subsequent remissions less well marked. The beginning of a fourth attack brought him to the hospital at this time. He has done practically no work since the beginning of his illness. Previous treatment had consisted in Fowler's solution for a short time.

Physical examination was negative except for pallor and blood. Blood, red count, 2,304,000; hemoglobin, 55 per cent.; white count, 3,800; neutrophils, 53 per cent.; basophils, 47 per cent. The red cells show considerable variation in size and shape, macrocytes frequent and average size larger than normal, good color but no polychromatophilia or stippling; platelets diminished. Urobilin in the stools was high. Wassermann negative. Resistance of red cells, 0.40 to 0.275. The patient lost ground rapidly, red count went down to

1,422,000; the hemoglobin remained at 55 per cent. January 5, he was transfused, receiving 600 c.c. of blood. Immediately after transfusion, the red cells numbered 1,648,000 and two days later, 1,920,000. There were no blasts. Frequent large markedly polychromatophilic cells were present and the platelets increased somewhat.

Operation and Result.—Splenectomy was performed January 11 by Dr. Vincent. On the following day the white count was 26,000 with no change in differential count. The blood showed an occasional Howell-Jolly body and a large number of blasts. Within four days the white count had dropped to 8,800, the blasts were still present in large numbers and the Howell-Jolly bodies very numerous. Platelets began to show a very slight increase at the end of the tenth day but increased no further. The red count stayed at about 1,600,000 but the hemoglobin dropped to 45 per cent. By the fourth week, however, the red cells reached 2,200,000 and the hemoglobin 70 per cent., at which time the patient left the hospital. The urobilin decreased markedly but did not reach normal. Fragility, 0.55 to 0.30. At discharge the patient weighed approximately the same as at admission but felt a great deal stronger. Three weeks after leaving the hospital, the patient reported that he had gained 30 pounds since getting up from bed. March 27, two and a half months after splenectomy, he returned for examination. He was looking well, had gained 40 pounds since the operation and was able to do light work all day without fatigue. His blood showed a red count of 4,112,000; hemoglobin, 77 per cent.; white count, 12,500. Red cells showed little variation in shape but marked variation in size. Many microcytes as well as macrocytes with the average size above normal; good color, no polychromatophilia or stippling; an occasional normoblast and large numbers of Howell-Jolly bodies; platelets above normal in number. Reticulated cells rare. Resistance of red cells, 0.52 to 0.25. Urobilin in the stools still considerably increased over normal, although lower than at the time of discharge.

CASE 4.—History.—T. D. (Hospital No. 199648), man, aged 43, entered the hospital Jan. 8, 1915. Family history was unimportant. Fifteen years ago he had to stop work for a period of nine months on account of being "run down" and feeling weak. The present illness began twenty months ago with a gradual onset of weakness, dyspnea on exertion, and later pallor. These symptoms have grown progressively worse, and recently there have also been vomiting and soreness of the mouth and tongue. No diarrhea; has lost over 40 pounds in weight. No systematic course of treatment had been followed.

Physical examination was negative except for lemon-yellow color of skin and blood. Blood, red count, 1,344,000; hemoglobin, 50 per cent.; white count, 4,400; neutrophils, 67 per cent.; basophils, 29 per cent.; eosinophils, 3 per cent.; mast cells, 1 per cent. Red cells showed marked variation in size and shape, no achromia, macrocytes frequent, occasional poikilocyte, many stippled and polychromatophilic cells. Rare normoblasts, platelets much diminished. Urobilin in the stools high. Resistance of red blood cells, 0.45 to 0.30. Wassermann negative. After eleven days in the ward the red count had dropped to 1,162,000 and the patient felt worse. A donor was procured, as it was thought transfusion would be necessary preparatory to splenectomy. However, at this time there was a shower of "blasts," 14 per cent. normoblasts and 3 per cent. megaloblasts, and within three days the red cells numbered 1,628,000 and the hemoglobin 70 per cent. The blasts soon dropped to about 2 per cent. and there was no further increase in red count or hemoglobin by the end of five days.

Operation and Result.—Splenectomy was performed January 27 by Dr. Vincent. The day following splenectomy the white count was 12,400 with 90 per cent. polynuclears. January 29, two days later, there was a shower of normoblasts, 14 per cent. A rare Howell-Jolly body was seen and the platelets showed a slight increase at the same time. The red count showed a gradual increase dating from splenectomy until discharge, Feb. 11, 1915, when it was 2,640,000. The hemoglobin remained at 70 per cent. The

red cells showed considerably less variation in size and shape. The urobilin in the stools dropped to normal. Fragility, 0.425 to 0.225. The patient did not gain weight, but felt much stronger than at entrance.

March 20, approximately two months after splenectomy, the patient returned for examination. He was looking and feeling much improved, but had gained only 4 or 5 pounds since discharge. Mental disturbance was discovered at this time, which may account for the fact that the general improvement had not kept pace with the improvement in the blood picture. However, a month later the patient was seen again. At this time he was looking well, had gained 12 pounds since the last visit to the hospital and felt much stronger. The red count was 4,824,000; hemoglobin, 80 per cent.; white count, 9,800; neutrophils, 47 per cent.; lymphocytes, 50 per cent.; eosinophils, 3 per cent. The red cells showed some variation in size, chiefly in the presence of macrocytes, but very little in shape; good color but no stippling or polychromatophilia; no blasts seen, platelets numerous and Howell-Jolly bodies frequent, reticulated cells not over 1 per cent. Resistance of red cells, 0.50 to 0.27. Urobilin in stools still normal.

CASE 5.—History.—E. E. W. (Hospital No. 199657), man, aged 44, entered the hospital Jan. 9, 1915. Family and past histories were unimportant. The present illness began one and a half years ago with a mild attack lasting only three weeks and followed by a rather incomplete remission lasting eight or nine months. At the end of this time he began to go down hill again and has been gradually growing worse ever since, but did not stop work until shortly before admission. No gastro-intestinal symptoms. Has lost 40 pounds since onset of disease. Previous treatment consisted of some unknown medicine, probably not arsenic, for the past six months.

Physical examination shows a pale, weak and very sick looking man. Visceral examination negative. Blood, red count, 800,000; hemoglobin, 28 per cent.; white count, 2,000; neutrophils, 42 per cent.; basophils, 55 per cent.; eosinophils, 3 per cent.; red cells vary largely in size and shape, good color, many polychromatophilic cells, "blasts" very frequent, 10 megaloblasts and 15 normoblasts seen in a count of 100 whites. Platelets very few in number. Wassermann suspicious. Resistance of red cells, 0.425 to 0.30. Urobilin high. Within three days the red count had reached 2,300,000; hemoglobin, 57 per cent.; white count, 8,000; the platelets increased and the blasts had disappeared almost entirely. He felt and looked much better. This improvement did not continue, and, in fact, at the end of two weeks his red count was slightly under 2,000,000; white count, 5,000; platelets, however, were numerous.

Operation and Result.—Splenectomy, January 28 by Dr. Vincent. The next day there was an occasional Howell-Jolly body present, the white count was 10,400, with 91.7 per cent. polynuclears. This count increased to 14,800 and then dropped to its former level in three days. Blasts did not increase noticeably till the fourth day after operation. The red count eight days afterward was 2,360,000; hemoglobin, 60 per cent. These increased to 2,840,000 red cells and 70 per cent. hemoglobin by the time of discharge, February 12, two weeks after operation. The red blood cells showed slightly less variation in size and shape. Fragility, 0.475 to 0.25. The urobilin in the stools was normal. The patient was feeling much improved when he left the hospital, but his weight was the same as at entrance. He went back to work almost immediately after leaving the hospital, and has worked practically every day since, but gets tired rather easily. April 13, two months and a half after splenectomy, he reported for examination. At this time he was looking somewhat pale. His general improvement did not seem to be nearly as marked as in the other four patients; however, he was feeling stronger than at any time during the previous year and a half. Red count, 2,904,000; hemoglobin, 60 per cent.; white count, 6,000. The red cells showed considerable variation in shape with an occasional poikilocyte; much variation in size; macrocytes frequent. The majority of the cells showed good color but

many were achromic and an occasional polychromatophilic cell was seen; frequent normoblasts and large numbers of Howell-Jolly bodies present; platelets slightly diminished. Reticulated reds not increased. Resistance of red cells, 0.57 to 0.25. Urobilin in the stool increased.

PATHOLOGY OF THE SPLEENS

In two cases the spleens were larger than normal, weighing, respectively, 192 and 237 gm. The other three spleens ranged from 137 to 167 gm. Grossly, there was nothing abnormal in their appearance. Microscopically, the changes seen were slight. Two of the three showed evident congestion of the pulp with rather fewer cells in the sinuses than normal. In two, many normoblasts were seen but not in clumps. One showed a few areas of primitive erythroblasts such as are seen in the bone marrow, suggesting the possibility of blood formation in the spleen itself. There was no evidence of increased phagocytosis, no fibrosis or pigmentation. This absence of any striking pathologic change agrees in general with the findings reported by other writers. Moffitt in his recent review of the subject finds hyperemia of the pulp and thickened arteries more constantly present than was the case in this series.

SUMMARY OF THE BLOOD FINDINGS

In all the five cases, directly after splenectomy there was a marked but transient leukocytosis, a shower of blasts and the appearance of Howell-Jolly bodies. At the end of a week or ten days the platelets began to increase. In one case this increase occurred even earlier. All these findings suggested definite stimulation of the bone marrow. The red count and hemoglobin showed very little change for the first two to three weeks after operation. However, by the fourth week there was an increase of about a million red cells and a rise of from 10 to 15 per cent. in hemoglobin. The qualitative improvement in the blood during the first four weeks was in the majority of cases greater than the numerical increase, that is, the red blood cells were more regular in size and showed fewer distorted forms.

After periods of from two to three and a half months (following splenectomy) four of the cases showed a red count of between four and five million and a hemoglobin of from 73 to 80 per cent., color index of 1 or less. Nevertheless, the appearance of the red cells, particularly the presence of frequent large forms, was still characteristic of pernicious anemia blood. The fifth case showed very little change in the blood picture after the patient left the hospital, except that the color index had come down to 1. In our experience it is unusual in pernicious anemia even in the remissions to have a color index of 1 or below.

The red blood cells showed a constantly increased resistance to hypotonic salt solutions within from two to three weeks after splenectomy. In two cases, hemolysis was not complete till 0.225 per cent. was reached. There was also a tendency for hemolysis to begin above normal; in one case hemolysis began at 0.70 and was not complete till 0.225. A change in the fragility of the red blood corpuscles has been observed after experimental splenectomy in dogs, and is probably not characteristic of pernicious anemia. Howell-Jolly bodies appeared very soon after splenectomy, and were still present in large numbers when the cases were seen from two to three months later. These small, round, darkly staining bodies found in

the red blood cells, and considered to be nuclear fragments, do not occur in normal human blood. They are found in the red blood cells in cases of congenital hemolytic jaundice and after splenectomy in man as well as in certain kinds of animals. The presence of these bodies seems to indicate a much increased bone marrow activity.

The number of reticulated red cells was not increased at any time. These cells occur in large numbers in congenital hemolytic jaundice, and seem to be associated in this condition with the increased bone marrow activity, since they represent a type of immature cells. Their absence in this series of cases following splenectomy is quite striking in view of the large numbers of Howell-Jolly bodies present.

The immediate decrease in the quantity of fecal urobilin⁴ following splenectomy indicates that a marked diminution in the degree of blood destruction had taken place. This became normal in four cases, and in the fifth, which showed the highest output before splenectomy, there was a marked drop. The later return to an increased urobilin excretion in Cases 2 and 3 suggests that the cause or causes of excessive blood destruction had not been completely removed.

This evidence of increased blood destruction, together with the abnormal blood picture, indicates strongly that the patients are still suffering from pernicious anemia. However, a marked change has come about in the relation of blood production to blood destruction. In Cases 2 and 3, which show red counts of approximately 4,000,000, the bone marrow is apparently fairly well able to compensate for the abnormal blood destruction going on. In Case 5 the compensation is not so good. The persistence of many normoblasts in the blood of all three of these patients indicates the marked bone marrow activity present. Cases 1 and 4 show a more striking alteration still in this relationship. In these two cases the abnormal blood destruction has ceased, thus obviating the necessity of excessive blood production. The blood supports this assumption in that, with the exception of the presence of Howell-Jolly bodies, there is much less evidence of increased activity on the part of the bone marrow.

It has been suggested that the hemolymph and other glands in these long-standing cases of pernicious anemia may acquire hemolytic functions, thus accounting for the abnormal blood destruction which persists after splenectomy. We see no reason to accept this theory; but, if true, it would be an argument for operation early in the course of the disease.

Symptomatically, the improvement during the first few weeks succeeding splenectomy was much greater than the blood picture would indicate. The appetite improved, the patient gained strength, his mental attitude became much more hopeful and there was a consistent increase in weight. Later reports show that with the exception of Case 5, this improvement has continued and that the patients are in better condition now than at any time since the onset of the disease.

In deciding the question of the time of operation, the most important consideration was the direction which the disease was taking. When the patient was failing, transfusion was performed before operation. Besides increasing the number of red cells temporarily

4. A detailed study of urobilin in pernicious anemia will be given in a later communication.

and apparently checking the relapse in some cases, transfusion has often initiated a remission. The remission, it is true, may be very incomplete in nature, yet the accompanying improvement in general condition is marked. If the red count is rising or if the patient is holding his own and is in good condition, we felt that it was safe to operate with a red count of anything over 1,500,000.

The operation which was done in all five cases by one of us (Vincent) was performed through a left rectus incision without special incident. Following the operation there was surprisingly little shock or discomfort, and recovery was rapid in every case.

SUMMARY AND CONCLUSIONS

The immediate results of splenectomy in this series of five cases of pernicious anemia was a prompt post-operative recovery and a definite remission of the disease in every case.

The remissions were much more marked than is usually seen in pernicious anemia. In four of the five cases the red counts rose to from 4,000,000 to 5,000,000. The remissions occurred so constantly that we are inclined to attribute them to the operation of splenectomy.

Our study shows that in spite of marked improvement, the blood picture still exhibits the accepted characteristics of pernicious anemia with the exception of the color index, which has been altered from high to normal or low. Furthermore, in three of the five cases, evidence of increased blood destruction was present several months after splenectomy, as shown by the urobilin estimation. These facts we can interpret only as evidence that the disease is not cured. It cannot as yet be stated that the improvement brought about by this means will last longer than the remissions which come spontaneously and which may persist over a period of years. From the very nature of the disease, it will be many years before the exact value of splenectomy can be determined.

The only conclusions we may safely draw from these cases combined with the reports of other writers are:

1. Splenectomy is not a very serious operation in pernicious anemia, and it offers a definite means of inducing a remission.
2. The remission thus brought about is more marked in the majority of the cases than any other known therapeutic procedure.

The School of Bagdad.—It is not surprising then, that the school of Bagdad became celebrated. Jewish physicians seem to have been most prominent in its foundation, and the most distinguished product of it is Isaac Ben Emran, almost as celebrated as a philosopher as he is as a physician. One of his expressions with regard to the danger of a patient having two physicians whose opinions disagree with regard to his illness has been deservedly preserved for us. Zeid, an Emir of one of the chief cities of the Arabs in Barbary, fell ill of a tertian fever and called Isaac and another physician in consultation. Their opinions were so widely in discord that Isaac refused to prescribe anything, and when the Emir, who had great confidence in him, demanded the reason, he replied, "disagreement of two physicians is more deadly than a tertian fever." This Isaac, who is said to have died in 799, is the great Jewish physician, one of the most important members of the profession in the eighth century. His principal work was with regard to poisons and the symptoms caused by them. This is often quoted by medical writers in the after time.—Walsh, *Makers of Medicine*.

ROENTGEN RAY EPITHELIOMA, CURABLE BY RADIUM

AN APPARENT PARADOX *

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At a section meeting of roentgenologists at the British Medical Association meeting two years ago I was impressed by the large proportion of this noble body of workers who had suffered from all degrees of Roentgen-ray injuries, from simple hyperkeratosis to amputation of one or more fingers, or one hand, or both.

I presented to them the possibility of curing the disease in its early stage by radium. Most of them seemed skeptical, but I found one physician from Australia who had suffered, and who had found in his own experience that radium had kept his hands well, as he had repeatedly applied it in this early type for some years. I showed photographs and spoke of cases which I will here quote.

During two years past, I have been more deeply impressed with its importance, as I have treated more cases. Logically, it is clear that if all of the vast number of senile keratoses and early epitheliomas of the face and hands can be cured with certainty by radium, then the early Roentgen-ray growths of the same type ought to yield equally well.

It is in the advanced stage of epitheliomas when the downgrowth of cells invades and envelops the squamous cell layer—followed by growth of pearls, lymphatic invasion and gland metastases—that no efficient action of radium, so far as we can yet see, is beneficial. Then, anything short of amputation or clean excision is without value. Subsequent to the early stage, however, most sacrifices of fingers and hands have taken place. It is to this point I wish to direct attention, for in the early stage I shall show that cure may be assured.

My first case so treated was in 1903. Five years after beginning the use of the Roentgen ray, the patient developed a typical epithelioma of the back of the left hand. One application of radium cured it, and there has been no recurrence after twelve years.

Three years ago a well-known maker of Roentgen-ray tubes came to me with a terrible exhibition of Roentgen-ray cancer of the chin, chest and both hands. One finger had been amputated and much useless surgery done on the other parts. Both hands had on them scores of epitheliomas of varying sizes and heights. A recurrence showed in the stump of the amputated finger with an enlarged epitrochlea lymph mass of half the size of an egg, and in the axilla and subclavian region of that side, a conglomerate mass resembling a large clenched fist. Hopeless as it all seemed, he wished me to excise the lymph and other related scar growth, and apply radium as well as possible, at least for experiment. This I reluctantly did much to his delight. During the convalescence he asked me to try what radium would do on the cutaneous epitheliomas which were, as he said, just the way the original trouble started.

I used one strong specimen of radium from my collection, and told him I had no doubt they would all

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