almost certain to be one of carcinoma, or in a very few cases where there has been an error of diagnosis the underlying condition is most probably one which can only be treated by operative measures.

When the patient has been suffering from a chronic gastric ulcer which has undergone a change in the symptoms suggestive of the onset of carcinoma the course to be pursued is definite. So long persistent an ulcer giving such definite symptoms ought never to have reached this stage before an operation was undertaken, and the difficulty before the surgeon will be, not whether to operate, but whether to carry out a more extensive partial gastrectomy because of the suggestive symptoms. In this type of case the test meal may still be normal, and the radiogram may be characteristic of an ulcer; but there should be no hesitation whatever, if there is the slightest suggestion of a carcinomatous change, either because the symptoms have become more persistent or less severe, or the appetite has begun to fail, or the vomiting has altered in character and does not relieve the pain, in performing a partial gastrectomy on the assumption that a carcinomatous change is present. I have unhesitatingly pursued this course, and have never had reason to regret it. In some 10 cases the removed portion of the stomach has shown to the naked eye a characteristic chronic gastric ulcer, but subsequent microscopic investigation has revealed the presence of a carcinomatous change, and the operation therefore has given the patient the chance of a permanent cure. If there is pyloric obstruction, operation must always be performed at the earliest opportunity, for it is evident that if a patient of middle age has developed a mechanical obstruction nothing but surgical treatment can overcome the trouble. Nevertheless, cases are still seen where medical treatment, including lavage and diet, has been carried out for some weeks or months until the condition has become hopelessly inoperable. In this variety, as in the last, a careful consideration must be given to the symptoms, and if there is the slightest suggestion that the obstruction is carcinomatous in origin a partial gastrectomy must be carried out rather than a gastro-enterostomy. The only difficulty which will arise is in those cases where there has been a long past history of a pyloric ulcer, for a short history of pyloric obstruction in an adult is almost certainly carcinomatous. When secondary to an ulcer the main points upon which a differential diagnosis will be made are the rapidity of the onset of the obstruction, the relatively early fall in the acid in the test meal, the loss of appetite, and the presence of a tumour.

The mere presence of a tumour in the region of the stomach is no counter-indication to operative treatment, nor, indeed, is its size or apparent mobility. It may be thought that the tumour is so big that it is certain to be inoperable, but massive carcinomata may occur on the greater curvature which give rise to a tumour 3 to 4 inches in diameter and yet are easily removable. The only counter-indication to operation in a tumour of this nature is the definite evidence of secondary deposits. Most frequently they show themselves as nodules in the recto-vesical pouch, which can be felt by rectal examination, as enlargements of the liver, or in the presence of ascites. It is true that the larger the tumour and the more fixed it appears to be the more likely is the case to be inoperable, but it has always been my experience that in doubtful conditions it is wiser to carry out the operation. Should this not be performed the relatives will always feel, after the death of a patient, that if only an operation had been carried out he might have been saved, whereas when it has been performed and the condition found to be inoperable they will consider that at least every attempt had been made to save him.

Of the technical steps in performing the partial gastrectomy I need say but little. There should be a wide and free removal of the lesser and greater omenta. The subpyloric glands around the head of the pancreas must be carefully dissected away. The coronary group of glands must be removed as high as possible, and it is my own custom in cases of doubt to dissect the glands from around the coeliac axis. The resection of the stomach should in all cases include about seven-eighths of the viscus, and the anastomosis can be best performed by the end-to-side method of Polya. It is my own custom to do this by the

old method of bringing a loop of jejunum up through the mesocolon, and making the anastomosis some 4 to 5 inches from the flexure. Many surgeons have abandoned this method and make the antecolic anastomosis, but in my hands the posterior method—if a small loop is left—is so satisfactory that I have seen no reason to change it.

It will naturally be thought that with the modern progress of radium treatment some use may be made of this form of therapy, but with our present uncertainty of the results of this method of treatment it has seemed useless to attempt to use it in the advanced and inoperable cases, for this would mean a wide application to the stomach, to the glands, and probably to the liver, but it does hold out a hope that if used in combination with operation it might do something to prevent or lessen the high recurrence rate. It has been my experience that the cases which recur usually show a large deposit either around the head of the pancreas or in the neighbourhood of the coeliac axis. I have therefore in my more recent cases been using radium after all partial gastrectomies, and have been inserting 12 milligrams around the coeliac axis and 8 milligrams around the head of the pancreas. These tubes are left *in situ* for four days. It is, of course, at present impossible to say what the value of this method will be, and indeed we shall not have any accurate statistics until at least five years have elapsed. Our present experience does show, however, that the insertion of the tubes may cause a little post-operative vomiting, but so far this has not been sufficient to make us abandon its use, and we still have high hopes that satisfactory results will ensue and that the number of lasting cures will be considerably increased.

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SERUM TREATMENT OF THE PNEUMOCOCCUS PNEUMONIAS.*

BY

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CLINICAL classification of the pneumonias in accordance with their probable pathological findings seems to be useful only in so far as they suggest the etiology. Such classifications may prove clinically disastrous, as when a diagnosis of broncho-pneumonia or "influenza pneumonia" is made, and the actual condition is Type I pneumococcus pneumonia. Such cases are common. Two were recently investigated by us; both proved fatal, and were due to pneumococcus Type I, and therefore probably amenable to serum therapy. They were not typed until they came under our observation very late in their course.

Etiological classification of the pneumonias is of value if it helps to determine treatment and prognosis. Until it was definitely demonstrated that serum treatment was useful in at least one of the pneumococcus pneumonias a further subdivision of the miscellaneous types of organisms that constitute the miscellaneous group, or Group IV, was, for practical men, scarcely worth the effort involved in separating them.

As the result of the carefully controlled experiment at Harlem, Bellevue, and New York Hospitals, carried on under the direction of Dr. William H. Park, it has been shown statistically that in Type I pneumonias the mortality can be reduced by the use of the refined antibacterial serum now available, so that instead of one patient in three, one

* Read before the Eastern Medical Society, February 8th, 1929. From the Medical Service, Harlem Hospital (Lewis K. Neff, Director) and the Littauer Pneumonia Research Fund of New York University.

patient in five dies. Though the statistics are not as definite in Type II cases, instead of one patient in three, one patient in four dies. A relatively useful serum for Type III pneumonia is not available.

As the result of the studies of Dr. Park and Miss Cooper, the patients at Bellevue and Harlem Hospitals are classified according to type; for this purpose thirteen different types are recognized. Dr. Park, Dr. Rosenblüth, and I gave the statistics of our service during the past two years at Harlem Hospital, and the other hospitals associated with us, in a paper in the *Journal of the American Medical Association* of November 17th, 1928. In brief, our results showed, in Type I cases, a reduction of fatality of 42 per cent., with a ratio of difference to standard error of 3.7 (regarded by statisticians as statistical proof), and in Type II cases a reduction of mortality of 22 per cent., with a ratio of difference to standard error of 1.9.

At Harlem Hospital we have treated alternate patients in the order of their admission, rating them on their arrival in the ward, and we have employed a standard method of management which applied to both the serum-treated cases and the cases not treated with serum.* As the result of our observations we were convinced not only that there were fewer deaths in the serum-treated cases, but that we saved patients who were more seriously ill, and shortened the time of their illness.

Satisfactory as were our results in the hospital and private practice, there can be no great reduction in pneumonia deaths in general until the serum is promptly applied by the physicians in practice throughout the community. It is only a relatively small number of pneumonia sufferers that are at the present time taken from their homes. While physicians were without any effective therapy to offer to their patients a policy of watchful waiting, with so-called supportive treatment, was justified, and, depending upon his limited experience in the particular season, the practitioner has felt either that his efforts were of value, or that the disease was especially virulent.

So long as it was necessary to spend hours desensitizing patients to unrefined horse serum, when frequent and severe serum sickness was the rule, and when large quantities of horse serum of unknown titre had to be injected, it was only to be expected that the serum treatment would remain a procedure limited in application to those hospitals in which exceptional facilities were available. Unless the diagnosis of Type I infection (for which the serum was intended) was made, injection of the serum was unjustified. At present there is in use a serum of strong titre, freed from most of its deleterious ingredients, and concentrated so that an efficient dose can be administered in the home after brief preliminary tests; the serum treatment has thus become available for the general practitioner.

With the successful introduction of the serum treatment of pneumonia we may hope for results equivalent to those which followed the employment of antitoxin in diphtheria—a marked reduction of the death rate from the pneumonias and a great improvement in the technique of preparing serum, with an increased skill in application; in other words, better typing and dosage. At present polyvalent serum is available in titres as strong as 3,000 units of Type I, and 15,000 units of Type II, and I have used serums as strong as 5,000 units per c.cm. A well-refined high titre serum, which has been freed of all chill-producing substances, is the aim of serum manufacturers. The Research Laboratory of the Department of Health, the Littauer Pneumonia Fund of New York University, and the Harriman Fund are directing their efforts to the production of such serums. The methods of refining are technical chemical processes which little concern the clinician.

With increased knowledge and with more funds, therapeutic serums for the more recently separated types will become available, and will no doubt prove as efficient in practice as they are in laboratory experiments. As long as we depend upon type specific therapy, methods for

improving and hastening the determination of the invading type of pneumococcus must occupy our attention.

Recently one of our workers, Mr. Albert B. Sabin, a student in the medical school of New York University, has developed an important improvement in the typing of pneumococci which may, in the 90 per cent. of cases apparently insusceptible to typing by the Krumwiede method, shorten the time of typing to as little as three hours. This method requires only few organisms. It has the further advantages that it requires little serum and can be performed without the elaborate arrangement of tubes and controls required in the usual agglutination and precipitation tests. The method, which will be published shortly, depends entirely upon the microscopic agglutination of organisms on a slide; it has been used in upwards of 100 cases and carefully checked with the older methods, and up to the present time there has been complete agreement.

This brings us to a discussion of the whole question of typing. Occasionally a report is received of one organism having been obtained from the sputum and another from the blood stream of the mouse, but it is most important to realize that, although the finding of one organism in the sputum may be reported, yet the patient is invaded by a different organism. For this reason blood cultures should be taken from all patients suffering from pneumonia, and the organisms recovered should be typed. In our experience* a positive blood culture has been found in 22 per cent. of all cases. The information thus obtained is not one of mere theoretical interest. A positive blood culture in a patient definitely defines the type of the invading organism, and also determines the need for increased intensity of treatment, if the invader be a Type I or Type II organism. Rosenblüth showed that the greatest benefit from serum, in our cases, was in the patients in whom a bacteraemia was demonstrable. However, in the absence of a positive blood culture the sputum should be typed; and when that is not available, swabbing from the gagged throat should be typed, because lung secretion may not be expectorated but swallowed after passing through the larynx.

In the absence of a positive blood culture and of evidence that there is a type specific invasion, or before it has been definitely proved that the organism recovered from the mouse's heart's blood is not Type I or Type II, for which the polyvalent serums are available, it seems safest, in the interest of the patient, to administer the serum we have for Types I and II, until antibody for these types appears. The very rapid disappearance of one antibody suggests its utilization by an invading organism. The administration of serum has apparently done no harm to those for whom it was not beneficial.

In our general experience more than 55 per cent., or more than half of the cases, are Type I or Type II. During the thirty-six hours which may elapse before the typing can be definitely determined valuable time and even life may be lost. There is nothing so disheartening as to find that a patient for whom a serum was available has died untreated with serum. It is just the same as if one were to withhold diphtheria antitoxin pending a throat culture report. Just as one sees patients die of diphtheria when the throat culture is reported negative, so one finds cases of Type I or Type II pneumonia get into such a condition that serum is unavailing when the report from the mouse peritoneum is Miscellaneous or Type X, and serum has been therefore withheld. On our service at Harlem Hospital serum, as stated above, is given to alternate cases on admission, and continued until the report from the typing of the mouse blood culture has been received. It is discontinued only when that is reported Miscellaneous or Type X.

There are errors inherent in the usual gross method of typing, as a result of which serum is occasionally given uselessly. These may be corrected by the more refined techniques. Some of these problems will be solved in time, and inaccuracies of diagnosis will become less frequent.

The Sabin microscopic typing method promises to prove a useful instrument, but more important than its use in

* The serum used is so concentrated that it contains usually 1,000 units of each of Type I and Type II per c.cm.; 10,000 units of each type is injected intravenously; the dose is repeated every eight hours until the temperature is below 102° F., or the presence of the specific type of agglutinin can be demonstrated by the Sabin method. Severe cases have larger and more frequent doses.

* The method of blood culture is described by Rosenblüth in his paper.

the diagnosis of type is the converse application—that is, the detection of antibody in the patient's serum with blood obtained from a finger puncture, and of the presence of sufficient antibody of the types for which the serum is intended. In this way serum may be injected more

frequently or continued less long, and possibly, if the typing is reliable, crises may be predicted. It is true that this method depends upon the assumption that protection and agglutination are present simultaneously. It has not been our experience that agglutinins have not been present in the absence of protection. A case will be described later which illustrates this point, in which serum was administered and the formation of antibody by the patient was demonstrable later in the disease. It is waste of time to continue to use serum after there is ample protection present, for that is all that the serum can do. The patient may die from anoxaemia, from pulmonary oedema, or collapse, or from other causes, but after protection is present in the blood the administration of further serum is utterly wasteful.

The serum treatment is not yet perfected; there are still patients who die in spite of serum, and it is these patients who are especially important for further study.

I give below the case records of a number of patients treated at the Harlem Hospital, so that you may understand our difficulties, and realize our satisfaction with what is being accomplished by the use of serum; and understand, too, our eagerness to have the serum treatment penetrate into private practice, so that the death rate from pneumonia shall be lessened. There were 9,951 deaths from this disease in New York City during 1928. If only 30 per cent. were amenable to, and treated with, Type I and Type II serum, the saving would be impressive. The time must come when the serum will be provided by the municipalities, and there is no reason why, with the present widespread use of intravenous medications, blood cultures should not be taken by practitioners and studied for them at the municipal laboratories.

CASE I.—Type I without Bacteraemia.

An obese female, aged 30, came into hospital on the fourth day of illness with a temperature of 104.6° F. Her blood culture was negative. She received 30,000 units of Type I, and 15,000 units of Type II antibody, in a single 10 c.cm. intravenous injection. The serum was administered before determining the type—both peritoneal exudate and mouse's heart's blood were Type I. This case shows the result to be expected with a large dose of serum.

CASE II.—Type I with Bacteraemia.

This patient, a physician, came in on the third day of his infection with a temperature of 106° F. His blood culture showed fifteen and three colonies per cubic centimetre on two agar plates. He received 14,000 units of Type I antibody that day; his temperature fell after the first dose. The next day he received, in three doses, a total of 48,000 units; the following day he received

24,000 units. On the sixth day of his illness, antibody, by the gross (Arlyle-Noble) method, was positive. He received on that day 63,000 units. The report came too late for us to be guided. The blood culture, taken on the second day, was negative. After the sixth day he was convalescent. The sputum was Type I in mouse peritoneum and heart's blood.

CHART 1.—Case IV.

day, but rose that evening. His blood culture continued negative. Nevertheless, as his temperature was much elevated, he received an additional 120,000 units during the next two days. At that time we were using a temperature above 102° as the exclusive guide to repetition of dose.

CASE IV.—Type I with Bacteraemia.

This was also a non-serum case. He had five colonies in one plate, and the broth was positive on the fifth day. The next day he received serum in divided doses, 76,000 units. His blood culture

CHART 2.—Case VI.

CASE V.—Type I.

This patient came in as a serum case. His blood culture was negative. He received 50,000 units of Type I antibody, and on the eighth day was still so ill that he was placed in the oxygen chamber. His temperature continued elevated. He was delirious. His pulse was of poor quality—128 per minute. On the ninth day of his illness, at 10 a.m., he received 30,000 units; at 6 o'clock that evening, when the next dose was due, a Sabin microscopic antibody test was performed. It showed agglutination of Type I antigen, and also of Type II. There was more clumping at 8.45 p.m., and still more at 11 o'clock that night. Serum

CHART 3.—Case VII.

CASE VI.—Fatal Type I Bacteraemia treated with Serum.

Not so fortunate is the result in the next patient. He received serum from the day of admission. The dosage was not large; he was given 15,000, 22,000, 24,000, and 20,000 units. The blood culture, taken on the day of

admission, was reported positive on the seventh day. There were two colonies to the cubic centimetre of blood, and the broth was positive. On that day no antibody was detectable in the blood. The blood culture continued positive, but the number of colonies did not increase. In spite of the large dosage there was no antibody detectable on the eleventh day, the day on which he died. In this case it is probable that the antibody was used up as fast as it was introduced. With the Sabin method it may become possible to give antibody so rapidly that an excess will be detected and patients saved. (See Chart 2.)

CASE VII.—Type V Bacteraemia with Recovery.

This case belonged to Type V; the blood culture was positive on the eighth day, though the temperature was below 102°. This patient either sterilized his own blood, or there was sufficient protection for Type V associated with the Type II serum. There were probably only 400 units of Type V protection given in the serum. (See Chart 3.)

CASE VIII.—Type V Bacteraemia mistaken for Type II: Fatal.

This patient was a married woman who, on the third day of her illness, had a positive blood culture and sputum; the organism was reported from another laboratory as Type II. On the fourth day she had a miscarriage at eight months. She received large doses of Type I and Type II serum. On the fifth day there was ample antibody for Types I and II. Her blood culture continued positive; the serum was unavailing. The original blood culture, which had been reported Type II, was then re-typed, as well as a blood culture after ample antibody for Type I and Type II had been administered and was demonstrable in the blood, and was found to be actually Type V.

CASE IX.—Type II Bacteraemia: Fatal—"Influenza Pneumonia."

This patient came in on the influenza service of the hospital. When a consolidation was discovered on the sixth day a blood culture was taken. He was given 15,000 units of Type II serum, and was placed in the oxygen chamber. Serum was administered more actively—as much as 60,000 units, 80,000 units, and 60,000 units being given. In spite of this intensive treatment antibody was not detectable in his blood. The colonies in his plate did not increase, but he continued to become more poisoned, and finally died on the twelfth day of his disease. It is probable that, in this case, if more intensive treatment had

been given at the very onset, sufficient to produce a positive agglutination test and maintain it, the result might have been different.

It will be seen from these cases that the problems connected with the serum treatment of pneumonia are numerous. Many of them are unsolved. Those of us who are working in hospitals, with ample laboratory assistance, have much for which to be grateful. I have shown the difficulties so that it should not be assumed that the serum treatment of pneumonia is a finished chapter; but I have also shown the triumphs, so that practitioners may be impelled to use serum in the treatment of their patients. If it is employed generally, so that the toll of pneumonia is lessened, as I believe it will be, the purpose of the Littauer Pneumonia Research Fund of New York University will be accomplished, and those who have devoted themselves to these problems will know that they have not worked in vain.

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THE CARE OF RHEUMATIC CHILDREN.*

BY

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For the past three years I have held, both at the Liverpool and the Birkenhead Children's Hospital, a special out-patient clinic for rheumatic children; to this clinic school medical officers have sent considerable numbers of cases, and practically all children have been recommended by doctors. Through the co-operation of the respective child welfare associations home conditions have been investigated and reported upon, and regular supervision of the children obtained. Most of the children have passed through one or more of the in-patient branches of the Liverpool or Birkenhead hospitals, and their supervision continued thereafter. Acute cases have mainly been dealt with in the city hospitals, while long-continued residential care has been carried out in the Heswall and West Kirby institutions. Most of these latter cases have been at the Heswall Hospital, some for many months, and all have had the benefits of special schooling and graduated exercises in addition to medical and nursing care. The physical condition of the children has been investigated as fully as possible, and attention paid both to general treatment and as regards points of focal infection. Reports have been sent to the respective chief school medical officers dealing with the actual physical condition—and particularly the condition of the heart—and recommendations made as to the desirable nature of school attendance or type of school.

Up till March 31st of this year 540 children had attended, a few of them since before the commencement of a special clinic and the others for varying periods since. At this date (March 31st) these cases could be classified thus: 321 children with apparently no permanent cardiac lesion, 119 children with an apparently established cardiac lesion but with satisfactory myocardial response, 25 children in whose cases I was still uncertain as to whether cardiac damage was permanent or not, 41 children with cardiac lesions and failing heart, 9 cases of death from rheumatic carditis, 9 children suffering from acute rheumatic fever, and 16 cases of congenital heart deficiency.

Excluding cases of congenital heart deficiency and all cases suffering at the date (March 31st) from acute rheumatic fever, the outcome of whose illness hung in the balance, and giving the benefit of the doubt in prognosis to all cases of doubtfully permanent cardiac lesion, I find

that of 515 cases medically recommended to the clinic as rheumatic, and accepted by me as such, 346 could be regarded as suffering from no permanent heart lesion, 119 definitely had a permanent lesion but showed good response, 41 showed evidence of failing heart muscle, and 9 had died. In other words, 50 children—10 per cent. of cases—had died or were unlikely to survive childhood, and another 119 children—25 per cent. of cases—were permanently crippled to a greater or less extent.

I put forward these figures with no further object than to show that rheumatic infection in childhood is a common and dangerous disease on Merseyside, and I cannot be accused of making a case for the rheumatic child, as these children were all sent to me as rheumatic or suspected rheumatic. During the first three months of this year—to March 31st—273 children attended the clinic on one or more occasions, and the average attendance was about 25.

In all, approximately 400 reports have been sent to the chief school medical officers, the form of each report being as follows:

RHEUMATISM AND ACQUIRED HEART DISEASE.

Name..... Sex..... Date of Birth.....

Address..... School.....

Place of Examination.....

History, symptoms, and physical signs.....

CLASSIFICATION OF CASE:

A.—Acute pyrexial rheumatism.

B.—Acute chorea, i.e., chorea of less than two months' duration.

C.—(1) Rheumatism or chorea other than that included in A or B;

with no heart lesion, or apparently curable heart lesion.

(2) Apparently permanent acquired heart lesion—good prognosis.

(3) Apparently permanent acquired heart lesion—bad prognosis.

RECOMMENDATIONS:

1.—Fit for Public Elementary School.....

A.—No restrictions.

B.—No violent games.

C.—No drill or gymnastics.

2.—Fit for Special P.D. School.....

A.—Day School.

B.—Residential School.

3.—Not fit for any School.....Period of exclusion.....

Signature of Examiner.....

Date of Examination.....

* A paper read at a meeting of the Liverpool Division of the British Medical Association.