number by far of those which have sequels, shows up this difficulty very strongly, for we have found that most of these consequential troubles owe their existence to specific residual infective elements which have lain dormant or more or less latent within the body, giving rise either to early or late sequels. These are, therefore, to be termed bacterio-toxic or microbic sequels. Of these we have examples in the various fevers, in diphtheria, influenza, malaria, and syphilis. We have seen that these may be manifested very variously in different organs and parts of the body. When affecting the nervous system they lead to central or to peripheral symptoms, according to the locality involved. With these we sometimes find associated sequels dependent on fresh invasion by microbic elements non-specific of the primal disease, but which are ever ready either within the system or outside of it to alight upon parts that have recently been rendered vulnerable by pre-existing morbid processes. These I term indirect sequels. We have seen that certain acute diseases sometimes reveal diathetic proclivities hitherto little marked or even dormant, as in the case of gouty or strumous habits of body, or which, as in the case of syphilitic taint, awaken long latent residues and so evoke revealing symptoms of unexpected character. These I term revealing sequels.

The debility and diminished tissue-resisting powers of the body induced by acute diseases or by exhausting influences and low state of health open the door to fresh invasion from within or from without, and in this way invite new sequels and often a succession of diseases. So-called "surgical scarlet fever" is, without doubt, an instance of true infection by that specific disorder to which patients are particularly prone after the shock and wound of an operation, owing to the vulnerability and susceptibility thus induced. Traumatism of many kinds is apt to be followed by either revealing symptoms of some constitutional tendency or taint. Thus, we have instances of puerperal septicæmia set up by invasion of varieties of specific and toxic microbes. We meet with cases in which tuberculosis awakens and rages after injuries to the head and other parts of the body, such as joints, and we have already noted the occurrence of erysipelas as an attendant on traumatism. We may take note of the diathetic and local determinants which materially affect the original incidence and the sequels of diseases. Weak points are attacked, areas of special vulnerability, and organs and parts whose functions are inherently inadequate—*loci minoris resistentiæ*. We perhaps too little regard the frailties of particular organs and tissues, frail by inheritance and prone to premature failure and decay, although adjacent to other and more robust portions of the frame of the individual, for likeness of organs and tissues goes by descent, as does mere likeness of features. Hence many puzzling conditions and surprises in the study of diseases. But the clinical physician must take note of such. Nervous sequels relate chiefly to neurotrophic disorders and neuralgia. Sequels due to chemo-toxic influences. Respecting many of these, we have to note the fact of symmetrical or bilateral nervous affections due to general impregnation of the system through the blood.

Complications of Diseases.—(a) Early, (b) late. Incomplete convalescence.

Sequels.—1. *Bacterio-toxic:* (a) Early, microbic, or germinal, with short latency; (b) late, microbic, or germinal, with longer latency; residual diseases; ultimate evolutions or manifestations of the original disease; (c) direct, specific of the primary disease; (d) indirect, induced by the primary disease, but due to fresh or secondary infections by new toxins—(a) already present in the body, or (b) newly introduced from without (mixed infections), hence succession of diseases. 2. *Revealing:* Determinative of manifestations of constitutional habits of body or of inherited or acquired specific (? germinal or particulate) taint. 3. *Nervous:* Neurotrophic, neuralgic. 4. *Chemo-toxic:* Arsenic, lead, mercury, silver, carbon monoxide, corrosive. 5. *Direct non-toxic:* Residual sequels, etc.; residual sequels probably determined to certain localities by tissue predisposition—(a) inherited, or (b) acquired by previous injury—*loci minoris resistentiæ*.

We have found that most sequels of diseases are an increased burden for the patient, but we have also noted that a few of them are even favourable and happy. The great

fact remains that the majority of sufferers from all manner of diseases are not the victims of sequels, and that for this majority the course of their maladies, when not directly fatal, is singularly and fortunately free from any important consequences. A study of the subject of the sequels of diseases cannot, however, fail to impress upon all of us who are actively engaged in treating patients during their illnesses the supreme importance of steadfastly regarding the patient, and not so much his disease, in all our therapeutic management. To conduct the patient prudently and safely through his troubles, to realise how he bears them and what they mean or may mean to him, to gauge his powers of tissue resistance and his reserves of vital power, to have regard to his mental condition and to all his particular environments, and to secure sound convalescence, is, as far as possible, to avert the worst consequences, early or remote, of the particular malady in progress. This, and no less than this, is the duty which lies before each one of us, and to carry it out effectually demands the best qualities both of head and heart that we can place at the disposal of our patients. And such qualities, I venture to say, have not been wanting in the lives and work of the majority of the great and good men who have adorned this venerable College and left us the legacy of their skill and of their characters, who have, no less, left us under the responsibility of maintaining here, as the physicians of England, the highest standards of work, of duty, and of professional honour. May we try to be worthy of our predecessors. We can hardly surpass them in any of these qualities.

It only remains for me to offer to you and to this auditory my best thanks for the kind attention given to me in this course of lectures.

ON SOME CASES OF CHRONIC NON-TUBERCULOUS PNEUMONIA AND THE CLINICAL VALUE OF INOCULATION EXPERIMENTS IN GUINEA-PIGS IN THE DIAGNOSIS OF PULMONARY TUBERCULOSIS.¹

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It occasionally happens that cases of chronic pulmonary disease are met with which in their physical signs have a close resemblance to tuberculous phthisis, but where careful and repeated examination of the expectoration fails to show the presence of any tubercle bacilli. In the majority of such cases which have come under my observation there has been evidence of an affection of the base of one or both lungs, whilst the apex has been free, and therefore there was presumptive evidence against the lesion being tuberculous. In spite, however, of the signs being over the bases rather than the apices of the lungs, and also notwithstanding the failure to find tubercle bacilli in the expectoration, I have frequently been in doubt as to whether the cases were really not tuberculous.

At the present day nearly every physician and pathologist will admit that the vast majority of cases of phthisis are of tuberculous origin; that it is extremely rare to meet with destructive processes in the lung, where there is a chronic history, and presenting the physical signs which the physician associates with the term phthisis, which are not of tuberculous origin; in other words, phthisis is almost, though not quite, an entity. There are, however, some cases where a chronic fibroid condition of the lungs is found which are not tuberculous. The majority of these, so far as my experience goes, are the result of acute pneumonia, in some cases of the croupous, in others of the catarrhal variety, where the inflammation has not run its ordinary course to resolution, but has gone on to the formation of fibrous tissue, usually associated with which is bronchiectasis, and more or less destruction of the lung.

It is possible that a few of these non-tuberculous fibroid

¹ Read before the Wigan Medical Society.

cases do not have an acute onset, but are chronic from the beginning, though in this connection we must not forget that the history of a case is apt to be extremely deceptive, that occasionally we see an acute pneumonia which has not had a sudden onset, but has had an insidious one, and where from the physical signs and from the subsequent course of the case, especially from the fact of the lesion clearing up and the lung returning to a healthy condition, we can have no doubt that the process was a simple inflammatory one. A few such cases have occurred in my own experience, where, when first seen, I have hesitated, on account of the insidious onset, to regard the case as a simple inflammatory and not as a tuberculous one, but where the subsequent course of the complaint, usually with slow recovery of the lung, has satisfied me that the process was simple inflammatory and not tuberculous.²

As regards the cases of chronic fibroid disease not of tuberculous origin and of gradual onset, and resulting in the fibroid transformation of the greater part of a lobe, usually the lower, or even the whole of the lung, and which would correspond clinically to what is known as Corrigan's cirrhosis of the lung, I have not met with a case, although I have carefully looked out for them, for more than ten years, and asked several of my medical friends to send me any specimens which they thought corresponded to it.

This fact of the failure to obtain a specimen of chronic fibroid affection of the lung, which was neither of acute nor of tuberculous origin, has always impressed me because we reside in a large mining district, and it seemed probable that such a condition might be met with among coal miners and others engaged in dusty occupations. As a matter of experience, one may state that in this district all the cases of phthisis in colliers and stonemasons which I have observed clinically have turned out to be of tuberculous origin, and although I would not for a moment wish it to be inferred that dusty occupations do not occasionally result in a simple non-tuberculous fibroid affection of the lung,³ I feel satisfied that this is rare, and that in by far the majority the destructive process of the lung in such people is of a tuberculous nature. With the above explanation of one's views on the relation of fibroid disease of the lung to tubercle, and to simple non-specific inflammation of the lungs, we may turn to what is more directly the subject of the present communication.

During the past two years I have sought for cases of chronic pulmonary disease of a destructive nature, where the repeated examination of the sputum failed to detect the presence of tubercle bacilli, and have inoculated guinea-pigs with the expectoration of such cases. In several of these cases the physical signs have been limited to the base of the lung, and therefore suggestive of a simple rather than a tuberculous process. In other cases the physical signs have been most marked over the apices of the lung. I have, however, in all these cases, whether the physical signs were most marked at the base or the apex of a lung, been in doubt whether the process was not really tuberculous, although tubercle bacilli could not be found in the expectoration.

In a few cases tubercle bacilli could not be detected in the expectoration at one period of the case, but at a later date they were found. As will be subsequently pointed out, it is probable that in these latter cases the sputum did contain, even at the earlier period of the affection, a very few bacilli, but in so small a number that they were overlooked in the examination, although the precaution was taken of employing different solutions to stain the bacilli, and to obtain the assistance of several colleagues who were accustomed to examine sputum for tubercle bacilli. In one such case, however, it is possible that the process was at first a simple inflammatory one, and that tubercle became subsequently, so to speak, grafted upon the fibroid lung.

In all cases the experiments were performed in a similar

² In this connection it is necessary to remember that we may get a simple acute inflammatory mischief round a small or large tuberculous focus in the lung, and that as the simple inflammatory mischief subsides the chief symptoms and physical signs markedly improve, but the subsequent history of such cases, and also usually the persistence of a certain number of morbid physical signs over the lung, show the real nature of such cases, and distinguish them from the simple inflammatory lung affections of insidious onset above referred to.

³ Such a case of non-tuberculous affection of the lung I published some time ago: Contribution to the Pathology of Pneumono-konics, *Jour. of Anatomy and Physiology*, 1881.

manner. The sputum was directly expectorated into a clean new bottle, and not into a possibly contaminated spit-cup; a small quantity of the sputum so obtained was inserted underneath the skin of the left thigh of a guinea-pig, and the process was repeated in a second guinea-pig, two guinea-pigs consequently being used for each case. The experiments were carefully performed and precautions taken to prevent the animals from being contaminated with any tuberculous or other virus other than that present in the sputum employed. The animals were then allowed to live for periods varying from three to six weeks, and were then killed by the administration of chloroform and *post-mortem* examinations made.

Experiments performed in this manner are, I believe, very reliable. Even at the present day I fear, however, that some medical men think that the guinea-pig is so susceptible to tuberculosis that you cannot rely on the results of inoculations. As a medical friend recently said to me when I was relating the result of an inoculation experiment, "Oh; but can you depend upon the result? I thought one had only to prick a guinea-pig, and he then became tuberculous." Although guinea-pigs do readily become tuberculous, if the experiments are performed in the manner above mentioned the results are reliable, as has been recently shown by Professor Delépine, who states in a communication bearing upon this subject that "Subcutaneous, submucous, intraperitoneal, and intraocular injections were made of non-tuberculous products.....Nothing resembling tuberculosis was obtained in any of these experiments (over 25), even in cases kept under observation for many weeks or months."

The following is a brief history of the cases, and the results of the inoculation experiments. The first 3 cases are specially interesting as they are brothers, and in the fact that another brother died at the age of 19 of an abscess in the lower lobe of the right lung, which ruptured into the œsophagus, the diagnosis being verified by a *post-mortem* examination.

CASE I.—F. B., aged 10, a schoolboy, was first seen by me on October 21st, 1892. His mother stated that he had been troubled with a cough since quite an infant. There had never been any hæmoptysis.

Present Condition (October 29th, 1892).—Fairly healthy-looking boy, 4 feet 5½ inches in height, weight 61 lbs. Has a slight cough, which he says is not very troublesome, and he only brings up now a very little phlegm. Chest is a very well shaped one. The physical signs revealed on examination of the chest are shown on Figs. 1 and 2.

Fig. 1.—F. B., aged 10. a, Small bubbles and rhonchi; b, small bubbles; c, impaired resonance; d, nipple.

Fig. 2.—F. B., aged 10. a, Small bubbles.

CASE II.—W. B., aged 16, a school teacher and brother to the above, was first seen by me on October 29th, 1892. His mother stated that he had always had a cough since he was about 2 or 3 years of age. No definite history of any severe attack of inflammation of the lungs could be obtained, but he had twice had some slight acute pulmonary affection, which had necessitated him laying up for a week on each occasion.

Present Condition (October 29th, 1892).—Pale, delicate-looking boy, height 5 feet 2½ inches, weight 91 lbs. States that he feels in good health, and has never been better than during the past few months. He has a slight cough, which, however, is not a troublesome one. States that he always brings up a small amount of phlegm, and occasionally after a violent fit of coughing a larger quantity, amounting to one or two tablespoonfuls. Respirations 20 per minute. Chest somewhat flat with a narrow antero-posterior measurement. No morbid signs over the front of the chest. The physical signs noticed over the back are shown in Fig. 3.

⁴ It has been necessary to abbreviate the history of the cases as much as possible in order to reduce the length of this communication.

Fig. 3.—W. B., aged 16. *a*, Small bubbles; *b*, impaired resonance.
Fig. 4.—G. H. B., aged 18. *a*, creaking sounds; *b*, small bubbles; also impaired resonance.

CASE III.—G. H. B., aged 18, brother to the above, was first seen by me October 12th, 1892. He stated that he had good health up to four years ago, when he had inflammation of the lungs and pleurisy. He was in bed fourteen days, and was so ill at one time as not to be expected to recover. He had never lost his cough since that illness, sometimes being worse than at others. He had occasionally seen a little blood in the expectoration. He is a well-built youth, height 5 feet 7 inches, weight 148 lbs. Looks fairly healthy, and is not anæmic. He states that he has no shortness of breath, even when he exerts himself by walking fast. He has a very slight cough, but he brings up a small saucerful of phlegm during the fit of coughing at intervals of two or three days; between these times he occasionally brings up a little mass the size of a shilling. Chest is a well-shaped one; there is no flattening, and nothing abnormal on percussion or auscultation can be detected over the front. The physical signs observed over the back of the chest are represented in Fig. 4.

The family history of these three cases is as follows: The father, aged 50, enjoys extremely good health, and is a big, fine man over 14 stone in weight. The mother, aged 48, enjoys good health, but is a somewhat spare, pale woman. There is one child in addition to the above three, living, aged 20, and in good health. Two children died in infancy, cause unknown, and one at the age of 19. Mr. Colin Campbell states that he attended this son for many months for cough and expectoration, and that two months before he died he had an acute attack which was regarded as pleurisy. In a few weeks he was able to go to work, and continued to do so until two days before his death, and was only seriously ill for about six hours, the chief trouble then being vomiting, and death being immediately preceded by the bringing up of about a pint of pus. Mr. Colin Campbell made a *post-mortem* examination, and found an adherent pleura on the right side and a large abscess cavity in the base of the right lung, and which had ruptured into the stomach, which was half full of fetid grumous pus.

Six specimens of sputum expectorated at different times by each of the above three patients were examined for tubercle bacilli, but none were ever found. In February, 1894, six guinea-pigs were inoculated with the expectoration, two being employed for each case. The subsequent *post-mortem* examination of these animals was entirely negative. All organs were perfectly healthy, and there was not a sign of tuberculosis at the seat of inoculation or elsewhere.

CASE IV.—C. M., a male, aged 56, was seen by me, in consultation with Dr. J. Turville Smith, on February 1st, 1894. He gave the following account of his illness:—He had been troubled with cough and expectora-

Fig. 5.—C. M., aged 56. *a*, Small bubbles; *b*, impaired resonance.
Fig. 6.—A. F., aged 24. July 11th, 1894. *a*, Dulness; *b*, bubbles; *c*, bronchial breathing and consonating bubbles.

tion for about the past thirty-five years, although it had been worse and more persistent during the last seven years. He had been repeatedly off his work during the last thirty-five years for about one or two weeks at a time with what he termed a bronchial attack, and these attacks had been more frequent during the past seven years. About three years and a-half

ago he had a severe attack of inflammation of the lungs, and was away from work three weeks. Six years ago he had a hæmoptysis, when he brought up about half a teacupful of blood, and the expectoration has occasionally been tinged with blood since. At the time I first saw him he was in bed with an acute pulmonary attack, and had been so for about a fortnight. He was then bringing up about 2 ounces of purulent expectoration in the twenty-four hours. There was dulness at the left base with numerous small bubbles, and there were also a few smaller-sized bubbles at the right base but no dulness at that part. I obtained some of the sputum, which I examined for tubercle bacilli with negative results, and on the following day I inoculated two guinea-pigs with the expectoration. Four weeks later he was able to leave the house for the first time, and came to see me. I was then able to make a more careful examination than I had previously made of him.

He was a pale, small man, 5 feet 5 inches in height, and weighed 9 stone. He stated that six months previously he was exactly 1 stone heavier. He had a slight cough, and was bringing up a small amount of very purulent expectoration, which had, however, considerably diminished since I saw him a month previously. The chest was well shaped, and there was no dulness or any morbid auscultatory signs over the front of the chest. The physical signs observed over the back of the chest are shown in Fig. 5.

The guinea-pigs which were inoculated on February 2nd remained quite well and healthy. Six weeks after being inoculated they were killed by the administration of chloroform, and the *post-mortem* examination showed that all the organs of both animals were perfectly healthy. There was no thickening at the seat of the inoculation, and there were no signs of any enlarged glands in the groins or elsewhere.

Dr. Smith told me that a few months later the patient had another acute pulmonary attack, which terminated fatally after a short illness, and that he had been unable to obtain permission for a *post-mortem* examination.

CASE V.—A. F., a milliner, aged 24, was admitted to the Manchester Infirmary on February 6th, 1894, with marked diphtheritic paralysis, which had followed an attack of diphtheria six weeks previously. The paralysis was very extreme, affecting all four extremities, the diaphragm, and the adductors of the larynx. She had a troublesome cough, which, however, on account of the paralysis, was very ineffective in getting up any expectoration. A day or two after her admission signs of pneumonia at the bases of both lungs developed. The signs of consolidation slowly but completely disappeared from the right side, but persisted at the left base. In May the patient was able to leave the infirmary for the Convalescent Hospital, but the physical signs at the left base were still present. She was re-admitted to the infirmary at the end of June. On July 11th it was noted that she usually expectorated about 6 ozs. of very purulent expectoration in the course of twenty-four hours. There was then dulness at the left base, with very marked bronchial breathing, and a few consonating bubbles (Fig. 6). The temperature was very slightly elevated, but during the previous two weeks it had never exceeded 99° F. The expectoration was examined six times for tubercle bacilli, by myself, by the Medical Registrar, Dr. Williamson, and by the house physician. None of us ever found any tubercle bacilli. On July 7th two guinea-pigs were inoculated with the expectoration, and on August 16th both animals were apparently perfectly healthy, but were killed by the administration of chloroform. A *post-mortem* examination was made, and all their organs were found healthy, and there were no signs of any tuberculosis.

This patient spent the winter of 1894 in the South of England, and I had an opportunity of examining her again in July, 1895. She had very much improved; had scarcely any cough. There was possibly slightly impaired resonance at the left base, and only at one spot near the inferior angle of the scapula could one detect a few clicks at the end of inspiration. She stated that she had no expectoration now whatsoever.

The case was evidently one of acute pneumonia, probably of the catarrhal type, where resolution of the greater portion of the affected parts of the lungs had taken place exceptionally slowly. And although the base of the left lung at the time of the last examination could not be considered perfectly healthy, there was manifestly very little permanent damage done to the lung, and the case illustrates how slowly a pneumonia may sometimes resolve.

CASE VI.—R. T., aged 37, a labourer, first came under my observation in January, 1894. He stated that with the exception of small-pox at the age of 17, he had good health up to six years previously, when he was attacked with shivering, pain in the chest, cough, and expectoration. He was able, however, to continue his work, though still complaining of these symptoms, for about three months, at the end of which time he was suddenly seized with dizziness on rising one morning, and had to be assisted back to bed, which he had to keep for the next seventeen weeks, and from his account it was evident that he was then suffering from some acute intrathoracic inflammation. He returned to his work, but never quite lost the pain in his chest nor the cough. After remaining at his work for five months, he had to give it up, on account of the pain and cough becoming more troublesome, and had to take to his bed, where he remained for a period of two months. After this he got much stronger, and returned to work, and kept at it for about eleven months, the cough and pain, however, though slight, never completely disappeared. He then broke down again, and had to take to his bed for another two weeks. This alternation of being sometimes able to work and at other times having to keep his bed continued up to the date I first saw him. He had during the previous three years several attacks of hæmoptysis, which varied much in severity; he had brought up as much as a cupful of blood at a time. Although he had lost weight during the early part of his illness, his weight had been stationary during the past sixteen months. He used to perspire a good deal during the early part of his illness, but for the past few years has not been troubled with it.

Condition when first seen, January 29th, 1894.—Patient is a well-built man

somewhat but not extremely emaciated, complaining of some pain over the left side of the chest, cough, and of a small amount of expectoration. The chest is a well-shaped one. The right side of the chest above and below moves much better than the left. The left infraclavicular region is not appreciably retracted. The physical signs found on examination of the front and back of chest are shown in Figs. 7 and 8. The cardiac apex beat is very distinct in the fifth space in the left mid-axillary line. In the second left intercostal space, 3 inches to the left of the median line, there is a small area where distinct systolic pulsation can be seen and felt. This pulsation covers a circular area about 1 inch in diameter; there is no unusual prominence of this part (Fig. 7). On auscultation over the area

Fig. 7.—R. T., aged 37. *a*, Nipple; *b*, hepatic dullness; *c*, impaired resonance; *d*, area of pulsation; *e*, dullness; *f*, tympanitic (? stomach) resonance.

Fig. 8.—R. T., aged 37. *a*, Divided breath sound with harsh inspiration at expiration; *b*, impaired resonance; *c*, bronchial breathing; *d*, dullness and weak breath sound.

of pulsation there is a faint but yet distinct systolic murmur, and an extremely marked accentuated second sound. Over the apex beat there are no unusual auscultatory phenomena. Posteriorly (see Fig. 8) there is no enlargement of the liver and the spleen cannot be felt below the costal margin. The urine is free from albumen. The expectoration was very small in amount, only about 2 ounces being expectorated. An exploring needle was several times introduced into the dull area at the base of the left lung, but with negative results. There was complete paralysis of the left vocal cord.

The patient has remained under observation since January, 1894; up to the present time (July, 1895), during which he has had several acute pulmonary attacks, chiefly of a bronchial nature, when he would have to spend a few weeks in bed. There has been no change in the physical signs over the chest, except that during the acute attacks sonorous rhonchi were audible over both sides and occasionally a few bubbles over the lower part of the left interscapular region, where bronchial breathing is always to be found.

Although there can be very little doubt that in this case we have to deal with a very much thickened left pleura and a certain amount of fibroid induration of the left lung, it is not certain that the man has not also a thoracic aneurysm. It is, however, quite possible that the pulsation noted in the second left space is simply due to retraction of the left lung and exposure of the pulmonary artery, and that the paralysis of the left vocal cord is due to compression of the left recurrent laryngeal nerve by the thickened left pleura.

The expectoration was repeatedly examined for tubercle bacilli, but always with negative results; and on July 7th, 1894, two guinea-pigs were inoculated with the expectoration. Five weeks later both animals appeared perfectly healthy, but were killed by the administration of chloroform, and the *post-mortem* examination showed no signs of any tuberculosis.

CASE VII.—J. McP., aged 46, by occupation a labourer, was admitted to the Manchester Royal Infirmary on August 3rd, 1895. He gave the following history of his ailment. With the exception of having ague and malarial fevers in India many years ago, he had enjoyed good health until March, 1890, when he had an illness which was believed to be influenza, and was in bed six weeks. A week later he resumed his work, but remained very weak. He had a severe cough and some expectoration, but there was no hæmoptysis. Since that time he has remained weak, and always had a cough. Occasionally there has been a little blood in the expectoration. He has been able, however, to remain at his work most of the time, but occasionally has had to give it up for a few days on account of the chest affection.

Condition when first seen.—Patient was a somewhat spare, delicate-looking man, complaining of cough and shortness of breath. Respirations 24. He was expectorating about 10 ounces of muco-purulent expectoration in the course of twelve hours. There was very little movement of the upper part of the chest on either side. There was slight flattening of both infraclavicular regions. The physical signs found on examination of the front and back of the chest are shown in Figs. 9 and 10. Posteriorly, no dullness anywhere over the right side, nor over the apex of the left lung. Decidedly impaired resonance, not amounting to absolute dullness, over the left base (see Fig. 10). The physical signs during his five weeks' stay in hospital remained much the same as on admission. The cough and expectoration, however, diminished somewhat.

The history of this case and the fact that there was evidence of an affection of the uppermost lobe of the right lung and of the lower of the left lung, were very suggestive of a tuberculous process. Nevertheless, during his stay in the infirmary, the sputum was repeatedly examined for tubercle bacilli and always with negative results. On August 30th,

Fig. 9.—J. McP., aged 46. *a*, Impaired resonance; *b*, divided breath sound with harsh expectoration; *c*, small crackles; *d*, nipple.

Fig. 10.—J. McP., aged 46. *a*, Crackles; *b*, impaired resonance; *c*, small bubbles.

1895, two guinea-pigs were inoculated with the expectoration. To-day, twenty-seven days after the inoculation, both animals are perfectly healthy, and there are no signs of any thickening at the seat of inoculation of any enlarged gland in the groin.⁵ The patient is at present at the Convalescent Hospital, and I have not had another opportunity of examining him.

CASE VIII.—F. Y., a male, aged 30, was first seen by me on October 20th, 1893. He gave the following history: He never had any acute illness during childhood except measles, but whether this was followed by bronchitis or pneumonia he could not say, as the illness occurred when he was only 3 years of age. He remembered that as a boy up to 12 years of age he was free from cough, but that since he was 12 years old he had been subject to cough and expectoration of phlegm, which, however, was not continuous, but would last for three or four days, and would disappear for periods of about a month. There had never been any hæmoptysis. In January, 1892, he weighed 165 lbs., and between that date and the following July his weight fell to 110 lbs. This loss of flesh he attributed to a very serious business worry, and there was no history which would suggest that the loss of flesh was due to any pulmonary affection.

Condition on October 20th, 1893.—Patient was a tall, thin man, weighing 122½ lbs. He was a highly nervous individual, but a very intelligent man. He came complaining of bringing up a small amount of offensive expectoration, which had only been offensive during the past six months, but, as above stated, he had been subject on and off to a cough with slight expectoration for the past 18 years. His breath was slightly but not very offensive, and as he had a number of decayed teeth, I was in doubt as to whether this might not be the cause of the slight offensiveness of the breath. On the examination of his chest at this date I could not find anything definite. There was no dullness and no morbid auscultatory signs. All his organs appeared healthy. This patient came repeatedly to see me, but it was not until the beginning of February, 1894, that I could find any definite morbid signs on examining his chest. On February 5th, 1894, he called on me and said that his cough had been worse, especially at night, and that after the first sleep he usually woke up with a violent fit of coughing, and brought up about 2 ounces of phlegm, the breath being very offensive during the fit of coughing. I examined his chest at this date, and found slightly impaired resonance at the left base. On auscultation at the

Fig. 11.—F. Y., aged 30, February 5th, 1894. *a*, Divided breath sound with bronchial expiration on coughing, also clicks of metallic character. *b*, Impaired resonance.

Fig. 12.—J. C., aged 15. *a*, Dullness and weak breath sound; *b*, tympanitic resonance and bronchial breathing; *c*, nipple.

⁵ Since the above date both animals have been killed by the administration of chloroform and no signs of tuberculosis were found on *post-mortem* examination.

inner side of the inferior angle of the left scapula there was divided respiration, the expiration being of a bronchial character when he coughed, but during quiet respiration the bronchial character was not evident. When he coughed one also noticed at the same spot a few clicks of a very dry metallic character. (Fig. 11.) No morbid sounds could be found at the right base or over either apex in front or behind. I saw this patient again on April 30th and on July 9th 1894. On the latter occasion I found that his weight had fallen to 113½ lbs. The cough was more troublesome, and the expectoration a little more copious and still offensive. His pulse was 114, and respirations 24 per minute. Temperature at 3 P.M. was 99.6°. The physical signs at the left base remained as before. I have not seen him since July of last year.

The expectoration from this case was repeatedly examined for tubercle bacilli, always with negative results, and on December 9th, 1893, two guinea-pigs were inoculated with some of the expectoration. For about two weeks after the inoculation one of the animals had signs of acute phlegmonous inflammation at the seat of inoculation and in the abdominal wall. This, however, subsided, and seven weeks after the date of inoculation both animals appeared healthy, and were killed by the administration of chloroform. The *post-mortem* examination showed no signs of tubercle in either animal.

CASE IX.—J. C., a boy, aged 15, by occupation a glass worker, was admitted to the infirmary on February 5th, 1895, complaining of cough and pain in the left side. He stated that about five months previously his cough commenced, and had persisted up to the present time. At the early part of his illness he said there was a little blood in the expectoration but after that he had not seen any blood, and he had never expectorated any large quantity of blood. The slightly sweet offensive smell which the sputum presented at times he said had been present from the commencement of his illness. He had always enjoyed good health, except that five years ago he had an enlarged gland in his neck, which suppurated and burst externally.

Condition when first seen.—Patient was a small boy of delicate and anæmic appearance, weighing 5 stone 9 lbs. He was troubled with cough and a small amount of very purulent expectoration, which had a peculiar sweet, slightly offensive, odour. There was very marked clubbing of the fingers, and on the right side of the neck was a well-marked scar, the seat of the abscess which he had five years ago. The chest was a well-shaped one. The physical signs found on examination over the front of the chest are shown in Fig. 12.

Posteriorly.—Dulness over the right suprascapular, supraspinous, and the upper part of the right interscapular regions. There was good resonance, however, below the spine of the scapula. Over the area of dulness at the right apex behind was weak vesicular respiration accompanied by one or two clicks during inspiration: no bronchial breathing was present behind at any part. The other organs presented nothing unusual.

The boy remained in the infirmary between nine and ten weeks, during which time his temperature at some period of the twenty-four hours was somewhat above normal, the highest point reached being 101.8°. The temperature was generally normal in the morning, though there were many exceptions to this, and elevated one or two degrees above normal in the evening. His general condition improved, and he increased 11 lbs. in weight. His cough and expectoration somewhat diminished, and he went to the Convalescent Hospital on April 13th, 1895.

The history of this case, coupled with the physical signs over the apex of the right lung, and the presence of a scar in the neck was very suggestive of a tuberculous affection, and yet during his stay in the infirmary the sputum was repeatedly examined by myself, by the house physician, Dr. Melland, and by the medical registrar, Dr. Williamson, with negative results. On April 11th, 1895, two guinea-pigs were inoculated with the expectoration. Seven weeks later both animals were perfectly healthy. They were killed by the administration of chloroform, and a *post-mortem* examination showed that all their organs were healthy. There was no tuberculosis of any part.

This patient remained at the convalescent hospital for three weeks, after which time he was readmitted to the infirmary. During his stay at the convalescent hospital he continued to improve, and gained a further 4 lbs. in weight. On the day before he left the Convalescent Hospital he had a small hæmoptysis, and the day after he arrived at the infirmary he had another hæmoptysis, bringing up about 2 ounces of blood, and the expectoration was tinged with blood for about a week afterwards. The expectoration from this time became very much more offensive and much more profuse. He subsequently developed signs of pyo-pneumothorax, and gradually sank and died on June 28th, 1895, about five months after he had first come under observation, and some ten months from the first onset of his pulmonary symptoms. A *post-mortem* examination was conducted by the pathological registrar, Dr. Kelynack, with the following result:—

Anatomical Diagnosis.—Chronic pulmonary cavity (non-tuberculous); acute suppurative bronchopneumonia; pyo-pneumothorax.

Thorax.—Right Pleura: Dense, firm, fibrous adhesions involving the whole of the right pleura. The lower part of the cavity is distended with several ounces of pus, and the empyema, gradually lessening in size, extends upwards almost to the apex of the lung; the walls of the pyo-pneumothorax are coated with yellowish-white patches of purulent-looking

lymph. Right Lung: Towards the upper and anterior part is an aperture which passes into a cavity in the lower part of the upper lobe of the right lung: this cavity is irregular, about the size of a walnut, and its walls are rough and dark in colour, but it presents no distinct tuberculous appearances. The remainder of the lung is in a condition of diffuse septic bronchopneumonia, and on section foci of pus well out from the lung tissue, leaving in places minute abscess-like cavities; on washing off the pus, foci are seen, yellowish-white in colour, and at first sight somewhat resembling tubercle, throughout the lung, but most marked in the lower lobe; these points, however, are apparently small patches of non-tuberculous bronchopneumonia. There are no bronchiectatic cavities; there is no distinct evidence of old tubercle. Left Pleura: Congested, no adhesions. Left Lung: Congested and in greater part irregularly consolidated by what appears to be septic lobular pneumonia.

Abdomen.—Liver: Large, weight 3 lbs. 14 ozs.; passive venous congestion and apparently "amyloid." Spleen: Normal in size. Kidneys: Slightly enlarged; cortex a little increased in extent, apparently "amyloid."

This case is specially interesting because from the history of it and from the physical signs which were observed during the first period of the youth's stay in the infirmary, coupled with the presence of a scrofulous scar in the neck, one felt that the case was in all probability one of tuberculous phthisis, but the fact of no tubercle bacilli being detected in the sputum, and the guinea-pigs which were inoculated with the expectoration not developing tuberculosis, made us doubtful whether the case was tuberculous, and the subsequent *post-mortem* examination showed no signs of tubercle. I think, however, it is possible, considering that the boy had a scrofulous scar in the neck, and that there was no assignable cause for the cavity in the upper lobe of the right lung, that the cavity may have resulted from a tuberculous focus which had completely sloughed away. Nevertheless, this possibility does not detract from the value of inoculation experiments, since there were no signs of any active tuberculosis in the lung of the boy at the *post-mortem* examination.

CASE X.—A. T., a dressmaker, aged 21, was admitted to the Manchester Royal Infirmary on January 25th, 1895, complaining of a very troublesome cough, and the expectoration of a considerable amount of very foul phlegm. She gave the following account of her illness: About twelve months previously, up to which time she had enjoyed good health, except for occasional epileptic fits, whilst engaged in her household duties she was seized with a sudden sharp pain over the right shoulder blade, and about half an hour after she had an attack of sickness. From this time she felt ill, but continued her household work for three days, being troubled during these three days with a slight cough, and a small quantity of expectoration, which even at that time she says, was very foul. Three days after the onset of her illness she took to her bed, she at that time being very hot and feverish, but she had no shivering. She kept to her bed for the next six months, bringing up during this time a large amount, usually about 7 pint, of very foul sputum. During the six months she improved, and was able to go about the house again for a short time, but soon had a relapse, and had to take to her bed for another four months. During this time she got slightly better, but after being up for a week she had a second relapse. The expectoration of offensive matter continued up to the time of her admission to the infirmary, varying, however, in amount.

Condition on Admission, January 25th, 1895.—The patient was an anæmic-looking girl, somewhat but not extremely emaciated, weighing 6 st. 13½ lbs. She lay in the supine position, as she stated that her cough was less troublesome when she did so than when lying on either side. She had no enlarged glands or scars in the neck, and no clubbing of the fingers or blueness of the nails. She had a troublesome cough which came on in paroxysms, and the breath even when she was not coughing was extremely offensive. The amount of the expectoration in the twenty-four hours was 13 ozs., and it was very purulent and very offensive. Respirations 36, pulse 104. Temperature on the evening of her admission was 99.4°, on the following morning it was normal. During the following four weeks it was generally considerably above normal, the highest point reached being 101.6°. After the first four weeks, and during the subsequent seven weeks of her stay in hospital, the temperature was generally normal both in the morning and evening, although on about four occasions the temperature in the evening rose, being 100° to 102° F. There was no evident dyspnoea as she lay in bed. The chest was well shaped and there was no flattening. The left infraclavicular region expanded slightly better than the corresponding part on the right side. Over the right supraclavicular, clavicular, and infraclavicular regions as far as the second rib, there was impaired resonance. Vocal fremitus here was a little more marked than on the left side. On auscultation weak vesicular respiration over the right apex. No adventitious sounds. At the left apex good vesicular respiration. Posteriorly: impaired resonance over the upper part of the right side of the chest, as far as the middle of the right interscapular region. The extreme right base was possibly less resonant than the left. Over the left side behind no dulness. Vocal fremitus slightly greater over the right side behind than over the left. Vesicular respiration over both sides behind, except in the middle of both interscapular regions where the respiration was divided, and expiration harsh and somewhat prolonged, but not perfectly bronchial. Over the right side the only adventitious sound audible was an occasional sonorous rhonchus; there were no bubbles. Over the left side no adventitious sounds. The disturbance caused by the examination caused attacks of coughing, and the breath became extremely offensive.

It was doubtful whether this was not the natural type of the respiration which is frequently heard in this region, and due to the proximity of the main bronch.

The patient remained in hospital eleven weeks, during which time her cough became somewhat less, and the expectoration a little diminished. The latter, however, varied from time to time; the amount was measured and was found to vary in the twenty-four hours between 1 ounce and 13 ounces. The physical signs over the chest underwent little change. The only thing noticed in addition to what has been previously mentioned was that occasionally a few clicks were detected during inspiration over the right suprascapular and supraspinous regions. She left the infirmary to go and stay with some friends in the South of England, and I have not seen nor heard anything of her since.

The expectoration was examined nine times by different individuals for tubercle bacilli, always with negative results. On February 11th two guinea-pigs were inoculated with the sputum; both animals remained healthy, and five weeks afterwards both were killed by the administration of chloroform. The *post-mortem* examination showed all organs perfectly healthy, and there were no signs of tuberculosis anywhere.

CASE XI.—H. S., aged 41, by occupation a plumber, was first seen by me on March 1st, 1893. He stated that he had good health until five years previously, when, whilst watching a football match, he caught cold, and had to return home. He was confined to bed from that time for three weeks, and had to remain from his work for a further period of nine weeks. He had been troubled with cough and expectoration ever since. During the last four years he had repeatedly expectorated a small quantity of blood, and on the first occasion he brought up about half a pint. The cough has been especially troublesome during the last three years, and he states that the expectoration has been from about 5 to 10 ounces daily.

Condition when first seen, March 1st, 1893.—Patient was a somewhat spare man, weighing 9 st. 9½ lbs. He complained especially of cough, expectoration, and shortness of breath. He brought up about 3 ounces of muco-purulent expectoration in the twenty-four hours. There was no time during the twenty-four hours at which he brought up any large quantity, the amount being more or less uniformly distributed through the day and night. For the first week the expectoration contained a considerable amount of blood. Pulse 84, respirations 24 per minute. There was distinct flattening of the right infraclavicular region, and the right lower lateral region of the chest was flatter than the corresponding part of the left side. The right side of the chest from the spine to the mid-sternum measured 16½ inches on the right side, and 17½ inches on the left side. There was very little movement of either infraclavicular regions, but the right moved very much less even than the left. Vocal fremitus over the right infraclavicular region greater than the left. The physical signs found on percussion and auscultation over the front and back of the chest are shown in Figs. 13 and 14. Over the left side of the chest, back and front,

Fig. 13.—H. S., aged 41. a, Weak bronchial breathing; b, small bubbles (simple and consonating); c, crackles; d, hepatic dullness; e, nipple.

Fig. 14.—H. S., aged 41. a, Bronchial breathing; b, dullness; c, small bubbles; d, crackles.

no dullness; vesicular respiration, accompanied by sonorous rhonchi at various parts; all other organs appeared healthy. The temperature during the first ten days of his stay in hospital was never above normal: after that time it was almost invariably elevated in the evening; at 8 P.M. it was usually between 99° to 101.2° F.; in the morning it was normal or subnormal. The expectoration was examined twelve times—by myself, by the house physician, and by the medical registrar, Dr. Williamson—for tubercle bacilli, with negative results. The patient remained in the infirmary nearly three months, during which time he gained about 6 lbs. in weight and his cough and expectoration became less, but the physical signs over the chest remained much the same as on admission, the chief difference noticeable being the disappearance of the sonorous rhonchi over the left lung. He was readmitted to the infirmary on October 24th, 1894. The physical signs were then much the same as when he had left the infirmary fifteen months previously. He stayed in the infirmary on this occasion about six weeks. The sputum was examined six more times for tubercle bacilli, making eighteen times in all, but with negative results.

From the end of 1893 until June, 1894, I lost sight of this patient. At the latter date he came to see me at the infirmary, and I obtained some of his expectoration. On June 12th I inoculated two guinea-pigs with it. After inoculating the guinea-pigs, I examined some of the remaining expecto-

ration for tubercle bacilli, and considering the numerous examinations that had been previously made with negative results I was surprised to find a few undoubted tubercle bacilli present. Both animals which had been inoculated showed subsequently signs of tuberculosis at the seat of inoculation, and they were killed a month after being inoculated by the administration of chloroform. The *post-mortem* examination showed well-marked tuberculosis, similar lesions being found in both animals, namely, a small thickened spot at the seat of the inoculation in the left thigh, marked enlargement of the left superficial inguinal gland, which was caseous, and contained creamy semi-fluid material. The left sublumbar gland was enlarged, whilst the corresponding one of the right side was unaffected. The spleen was large and contained a few small miliary tubercles. The liver, lungs, and heart were healthy.

I occasionally saw the patient after this date. The cough and expectoration persisted, and he had repeatedly to take to his bed for short periods. I am unable to say whether the physical signs over the chest underwent any change. He was, however, able to do a little work as a plumber, but on August 24th, 1895, when returning home from his work, he fell down dead. No *post-mortem* examination could be obtained.

It is not quite certain whether this case was one where we had to deal with a simple non-tuberculous chronic pneumonia on which tubercle had subsequently become grafted. The fact of the repeated examination of the sputum having been made during the earlier part of his disease with negative results as regards tubercle bacilli, whilst they were found at a later period, would tend to support such a view, but one hesitates to trust negative observations as regards tubercle bacilli in the sputum, as a case which I have already published (Case XII)⁷ shows where within a period of a few weeks no fewer than twenty examinations of the sputum were made, and no tubercle bacilli were found, but guinea-pigs inoculated with the expectoration which had been previously examined with negative results developed tubercle, and the twenty-first examination of the sputum showed the presence of a few undoubted tubercle bacilli. That case also subsequently proved fatal, and the *post-mortem* examination showed the presence of an undoubted chronic tuberculosis of the lung. It is therefore possible that in Case XI tubercle bacilli were present in the sputum, even at an early period, but were so scanty as to escape detection. I cannot help thinking, however, that it is more probable that in this case we had to do with an unresolved acute croupous pneumonia which had ended in the formation of a fibroid lung, and on that tubercle had subsequently become grafted.

CASE XIII.—This case was that of a gentleman who in the autumn of 1894 presented distinct signs of phthisis at the left apex, and in whose expectoration a large number of tubercle bacilli were repeatedly found. He spent the winter of 1894-95 in Switzerland, and returned in the spring of 1895 to England very much better. The sputum still, however, contained a few tubercle bacilli. During May, June, and July he continued to improve; the cough became very much less, and he increased very much in weight. The morbid physical signs, also, had very much diminished. Instead of there being dullness and numerous adventitious sounds at the left apex, there only remained impaired resonance, and not a single adventitious sound could be found anywhere over the chest. He occasionally in the morning would bring up one or two little purulent masses of expectoration. These during the summer of 1895 I examined on three different occasions for tubercle bacilli, with negative results. Being anxious, however, to see whether the case had really healed, and whether tubercle bacilli were really absent or simply overlooked in the sputum, I obtained a fourth specimen, and inoculated on August 30th two guinea-pigs. After inoculating the animals I examined part of the same expectoration, and found a few undoubted tubercle bacilli. One of these animals we have killed to-day, five weeks after the inoculation, and there are well-marked indications of tuberculosis from inoculation. The other animal, although it has not yet been killed, presents marked enlargement of the left inguinal gland, and is undoubtedly tuberculous.

It will be noticed that the majority of the experiments here recorded have been negative in their results; the sputum which was inoculated not producing, in the majority of cases, tuberculosis. As stated at the commencement of the communication, those cases alone were selected where either no tubercle bacilli could be found in the expectoration, or where the case presented some difficulties in interpretation. There were three cases in which a very few tubercle bacilli were found in the sputum, either before the time of inoculation

⁷ *Medical Chronicle*, 1894-95, vol. ii, new series, pp. 98-100; and *Indurative Mediastino-Pericarditis*, by Thomas Harris, M.D., F.R.C.P., pp. 28-39.

or subsequent to it, and in each of these three cases the guinea-pigs became tuberculous. In the other cases no tubercle bacilli were even found in the expectoration, and in no case did the animals become tuberculous.

I think these experiments will show how reliable such experiments are in guinea-pigs if carefully performed, and that if expectoration from a human being which is not affected with tuberculosis is inoculated into guinea-pigs, and precautions are taken in the experiment to prevent contamination, the animals so inoculated do not develop tuberculosis, and that further a specimen of expectoration from a tuberculous pulmonary case in which tubercle bacilli cannot be found, even by observers accustomed to such an examination, when inoculated into guinea-pigs may, and frequently does, produce tuberculosis in the inoculated animal, and so allow us to diagnose, with greater accuracy than we could otherwise do, the accuracy of the case.* The experiments also lend support to the view, that we do occasionally meet with fibroid conditions of the lung of a simple pneumonic nature which in their physical signs closely resemble tubercle, but which are nevertheless of a non-tuberculous nature.

In conclusion I must express my indebtedness to Professor Sheridan Delépine for the use of the Pathological Department at the Owens College for making the above experiments, and for his kind help and advice in connection with the subject.

A RAPID METHOD OF PERFORMING ENTERECTOMY WITHOUT THE AID OF ANY SPECIAL APPARATUS.

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THE suggestion of Mr. Greig Smith, in his paper entitled *Is the Apposition of Peritoneum to Peritoneum a Surgical Error?* in the *BRITISH MEDICAL JOURNAL*, 1895, vol. i, p. 1, that the principle of sero-fibrous union might possibly be applied to the operation of enterectomy, seemed to me of especial importance to those working abroad, who are very unlikely to have at hand such appliances as Senn's plates, Murphy's buttons, or Mayo Robson's bobbins. I consequently devised the following method in January, 1895, but now (November, 1895) I have been able to prove its practicability. The method consists in turning back the peritoneal coat off one end of the small intestine, after resecting a portion of the gut, suturing the muscular coat thus exposed to the peritoneal coat of the other end of the intestine, subsequently turning down the reflected portion of peritoneum over the first row of sutures, which are thus completely buried, and suturing its deep fibrous surface to the outer serous surface of the unreflected end of the intestine. Thus a double sero-fibrous union is obtained which will unite both quickly and firmly. The inner sutures are passed through the muscular coat of one end and the muscular and peritoneal coats of the

Fig. 1.

Fig. 2.

* In this connection one should say, however, that like all negative observations they are open to one possible fallacy. I think it is quite probable, although it has never occurred in my experience, that the sputum from a case of tuberculous phthisis may occasionally fail from some reason or other to produce tuberculous disease in the inoculated animal.

other end of the bowel, which afford ample material for holding, whilst the outer sutures include the peritoneal coats only. The accompanying diagrams show the method of passing the sutures, and the parts brought into apposition. The inner wavy lines represent the mucous membrane, the thick lines the muscular, and the thin straight lines the peritoneal coats of the small intestine. Fig. 1 represents on the left hand side the peritoneal coat turned back from one end of the bowel, and on the right the method of passing the inner suture. Fig. 2 shows on the left side the parts brought into apposition on tightening of the inner suture, and on the right side the second suture is also shown in position, completing the junction.

If the usual method of numerous interrupted sutures be employed, the method thus briefly described does not appear to have any special advantages except the firmness of the union obtained, and would have the counterbalancing disadvantage of adding to the length of the operation the time taken in reflecting the peritoneum, whilst in the class of cases for which enterectomy is employed a reduction in the time taken in performing it is the goal of all modern improvements in the operation. The firmness of the union to be expected from this method, however, led me to hope that both the inner and outer sutures might be continuous ones, and thus the length of the operation could be materially reduced. The question of the possibility of turning back the peritoneum and the feasibility of obtaining a watertight junction by means of continuous sutures remained to be decided.

In July, 1895, I had an opportunity of trying the operation on a dead body. I found that by beginning at the mesenteric attachment the peritoneum could easily be peeled back from the divided end of the small intestine as far as was desired, the fingers being used for this purpose after a start had once been obtained by the aid of a pair of dissecting forceps. A common sewing needle and thread were used, and the intestine was united without difficulty in the manner above described. Owing to the sutures having been inserted too far apart, the union was not quite watertight, but the possibility of turning back the peritoneum and of using it to bury the first row of sutures was demonstrated. On a subsequent occasion I succeeded in resecting the intestine by this method *post mortem* and in making the union quite watertight when two feet of the gut above the junction was filled with water and hung up, the whole operation having been completed in twenty minutes in this instance. This result was highly encouraging, and about the same time I performed the operation on the dead body of a dog. Here a difficulty in reflecting the peritoneum was encountered, as this coat of a dog's intestine was found to be thicker, more tightly adherent, and more brittle than that of man; but a watertight junction was effected in twenty-five minutes, whilst the calibre of the gut was not materially constricted, and the junction of the mucous surface was only visible as a slightly raised line internally. It now remained to be determined if the method could be carried out on a living animal with success. The dog was chosen for convenience, and the difficulties of the method being greater in the case of the dog's than in the human intestine, it was evident that if it could be successfully performed in the dog it could certainly be done in the human subject with even greater facility.

A large, healthy, though somewhat old, pariah dog having been obtained, chloroform was given, and was taken very well. The abdomen having been opened, and a loop of small intestine having been drawn out, it was clamped in two places by means of a thin flat piece of wood pointed at one end, and having a slit in each end, through which a piece of tape could be passed. The tape, knotted at one end, having been passed through the slit in the blunt end, the sharp end of the piece of wood was passed through the mesentery close to the bowel, and the tape, passed over the bowel and through the other slit, was pulled sufficiently tightly to compress the bowel between the piece of wood and the tape to the desired degree and then fixed with a pair of artery forceps. This simple and easily improvised piece of apparatus worked very efficiently. On cutting through the bowel its lumen was found to be full of tape worms. After several feet of these had been removed the operation was proceeded with. There