SOME ADVANCES IN GENERAL AND PREVENTIVE MEDICINE DUE TO COMPARATIVE PATHOLOGY.[1]

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COMPARATIVE PATHOLOGY is the youngest branch of medical science, but it is growing in importance rapidly year by year. The field of work in this subject is very large, including as it does the study of all communicable diseases, be they brought about by animal or vegetable parasites, which attack both man and the lower animals. The study of the characteristics and life history of animal and vegetable parasites is itself very important, and when there are added to this the effects which they produce, not only in the different organs of men but also of many other animals, effects which are commonly known as disease, it can readily be seen how large the subject may become. With the study of comparative pathology the name of Dr. G. Y. Heath, the late Professor of Surgery in the University of Durham, will always be associated, for he took a great interest in all branches of it and provided for the permanent teaching of this subject in the University of Durham by endowing a chair of Comparative Pathology. The growing importance of this subject is still further shown by the steps recently taken by the General Medical Council to provide that all those who present themselves for examinations for degrees in hygiene or diplomas in public health, shall have an adequate and practical knowledge of "bacteriology and the diseases of animals transmissible to man." In this country, unfortunately, the public are slow to recognise the immense value of preventive medicine to the community at large, and the great importance of having for medical officers of health men who have had a special training for that branch of medicine, and who, by the provision of sufficiently large salaries, would be enabled to devote their whole time to the work. We are, however, moving in the right direction, and even now a candidate has little chance of obtaining a post of importance in the public health service unless he holds a degree in hygiene or a diploma of public health. It is not my intention to point out the immense strides which the science and art of surgery have made by the practical application of facts which were, in the first place, revealed by the study of bacteriology, for the great saving of life and diminution of suffering which have been effected by the introduction of antiseptic and aseptic surgery by Sir Joseph Lister are so well known that I need only mention them. This alone shows how important the study of bacteriology is to the surgeon who would successfully apply the principles of antiseptic surgery to his practice. In learning how to make and keep a test-tube full of nutrient medium sterile, you learn much that will aid you in excluding bacteria from wounds and destroying those which have gained access to them. The methods of accomplishing these two great objects of antiseptic surgery are, of course, many in number, and in deciding which you will use in any given case, you will be guided by your knowledge of the principles which underlie them. It is clear that in all diseases which are caused by an animal or vegetable parasite we have, at the outset, two sets of factors to consider. There are, on the one hand, the circumstances which affect the condition of the parasite; on the other, those which affect the condition of the person who is attacked. For the production of the disease the parasite must gain an entrance into the body in the first instance, and must be able to grow or multiply in it. In such diseases we call the parasites which are able to invade the body the "exciting cause," and any influences which render the tissues more suitable for their growth "predisposing causes." It is evident that, however strong the predisposing causes may be, as long as the exciting cause is absent the disease will not develop. Thus, however strongly predisposed to phthisis a man may be, no phthisis can develop in him until the tubercle bacilli have gained access to his lungs, for we have no reason to believe that a tubercle bacillus can be spontaneously generated. In dealing with this class of disease it is of the greatest importance to have a clear conception of the relationship of predisposing to exciting causes, for the importance of the former has sometimes been unduly magnified, while that of the latter has been underrated. When once infection has taken place, the course which the disease takes is influenced both by the virulence of the invading microbe and by the resisting power of the person who is attacked. Thus physicians are always striving to find more efficient means of directly attacking the invading microbe, on the one hand, and of increasing the natural resistance of the patient, on the other. We are provided with various means of resisting the invasion of pathogenic bacteria, one of the most important of which is inflammation. Around the point of inoculation there may be a zone of inflammation; the phagocytes which are present attack and destroy the bacteria, being aided by the plasma, which acts as a poison to them. Thus there is a struggle between the invading microbe on the one side and the defensive cells and plasma on the other, which continues until either the microbes are destroyed and recovery takes place or the bacteria succeed in gaining a footing and the infection becomes generalised. In some cases the course of events may be rapid, in others it is slow. For example, a man who has a scratch on his arm, in lifting a hide which has come from an animal which has died of anthrax, is inoculated with the spores of the anthrax bacillus. A malignant pustule is the result. If the nature of the disease is recognised early, and if the bacilli are destroyed by cauterising the seat of inoculation and their spread into the surrounding parts is prevented by hypodermic injections of carbolic acid, recovery will take place. If energetic local treatment is not undertaken early the bacilli get into the blood stream and the disease becomes generalised. If tubercle bacilli gain an entrance into the lungs several different results may follow. If the man is healthy and not predisposed naturally to tuberculous infection the bacilli may be destroyed and no disease follows. The bacilli may gain a footing at first and multiply in the apex of one lung. The inflammatory reaction leads to a localised consolidation of the lung. At this point, in a favourable case, the disease becomes arrested, and the bacilli cease to invade fresh tissue and may be destroyed altogether. The patient regains his health, and when he dies many years afterwards a fibrous nodule in the apex of the lung is all that remains to mark the site of a battle upon the issue of which his life at one time depended. That this happy result is by no means rare is shown by the frequency with which the scars of the wounds inflicted by the tubercle bacillus are found in the lungs of those who have afterwards succumbed to some other disease. Only too often the bacilli encroach further and further into the lung tissue and the patient dies from phthisis.

It is important to have a clear conception of the *modus operandi* of parasites in the production of disease, as an intimate knowledge of the pathology of the process is a guide to rational lines of treatment. Many of the animal parasites produce symptoms in a mechanical manner. Thus the symptoms produced by hydatid disease in any part of the body are due to the mechanical pressure exercised on the surrounding tissues by the growing cyst. The bilharzia hæmatobia, which lives in the venous system and especially in the veins of the urinary organs, causes hæmaturia by damaging the wall of the veins and so allowing the blood to escape. In microbic diseases the effects are for the most part due to the poisons or toxines which are formed in the body by the action of the bacteria on the fluids and tissues with which they come in contact. In cases of general infection, such as anthrax, the blood contains both bacteria and their toxines; in other cases the bacteria only grow at one spot, as in diphtheria or tetanus, while the toxines which produce the constitutional symptoms are carried to all parts of the body by the general blood stream. These glimpses at the inner working of disease serve to interest us more deeply in our work and save us from drifting into that dangerous condition of empiricism in which treatment is confined to the application of remedies to relieve separate symptoms as they arise, while the general processes of the disease are overlooked, a condition which is fatal to the proper development of the *mens medica*. When we have ascertained that the illness of a patient is due to a known parasite or microbe several special lines of treatment are open to us. We can attempt to remove the parasite from the body altogether or to kill it *in situ* if it cannot be removed. If this is not possible, we can direct our attention to altering

[1] A Presidential Address delivered before the members of the University of Durham Medical Society.

the condition of the patient and his tissues, so that they become an unsuitable soil for the growth of the invader, or we can use means to counteract the harm which is done by the presence of parasites and their secretions in the body. In the case of disease caused by animal parasites the first line of action can frequently be taken, for many of these parasites are large in size, few in number, and easily got at. An ascaris lumbricoides is without difficulty killed by a dose of santonin and removed by a dose of castor-oil from the intestine. The hydatid cyst of the tænia cænurus, which so often develops in the brain of a sheep, can be readily removed by boring a hole through the sheep's skull, allowing the fluid to escape, and then drawing out the cyst wall by means of a notched quill, an operation which is frequently performed with success by shepherds in Northumberland. It is an interesting fact that, even in the reign of Henry VIII., instruments were made for this early advance in cerebral surgery. In diseases which are caused by bacteria the destruction of these latter is a much more difficult matter, owing to their small size, enormous numbers, and rapid multiplication. When the disease is localised in a situation which can be easily reached, the bacteria can often be removed or destroyed. A superficial abscess can be opened, and with the pus a large number of the suppuration organisms are got rid of, while others can be killed by the use of an antiseptic lotion, and healing takes place rapidly. When tubercle bacilli are confined to a joint or to a group of superficial lymphatic glands they can be got rid of by removing the diseased tissue by surgical measures. We never know when tubercle bacilli in such situations may enter the blood stream in sufficient numbers to set up general tuberculosis, so that it is well to remove them from the body as early as possible. When once pathogenic bacteria have settled in a deep-seated organ it is a much more serious matter, and our difficulties in treatment are greatly increased. At present, the agents which we know will kill the bacteria cannot be applied efficiently without injuring the patient also; in ague, however, we do possess a remedy—viz., quinine—which kills the hæmatozoa, which are the cause of that disease, without injury to the patient.

The action of this drug on these parasites can be observed under the microscope. If a drop of solution of sulphate of quinine is added to a drop of blood from a case of ague, containing the living hæmatozoa, in a short time the movements of the flagella cease and the parasites are dead. In some cases of bacterial disease such a specific remedy as this, which would act on the bacteria alone, would not be sufficient to cure the disease. Bacteria secrete poisons, and in a case of diphtheria it is quite possible that when we first see the patient he may have already absorbed a fatal dose of the chemical poisons, so that, even if all the bacilli in the membrane could be destroyed at once, he would still be killed by the toxines. For the successful treatment of such a case it is evident that we require something more than an agent to kill the living bacilli; we must, in fact, possess an antidote to the chemical poisons as well. The same holds good with regard to traumatic tetanus. Very often even the removal of a limb with the wound in which the tetanus bacilli are present fails to save the patient, because at the time of the operation he has received a fatal dose of the tetanus toxines.

Having thus considered in a general manner some of the advances in our knowledge which we owe to comparative pathology we will take up some more detailed examples of these points so as to make the matter more clear to you by definite illustrations. Anthrax forms a striking example of the amount of knowledge which may be gained by the careful bacteriological investigation of a disease. It is communicable to man by inoculation and by inhalation of the germs. The disease is caused by a bacillus which is found in the blood in enormous numbers; it forms a very resistant spore when any of the blood escapes from the body and is exposed to the air. As hæmorrhages frequently occur in animals suffering from anthrax, the spores are spread over the grass and convey the disease to healthy animals who eat it afterwards. Pasteur has also shown that these spores may be brought by earthworms from a buried carcase to the surface of the ground. These discoveries have shown us that, in order to prevent the spread of the disease among animals, the affected animal should be isolated as soon as possible in a place which can be disinfected afterwards. The body should not be opened after death, so as to prevent the escape of blood and formation of spores; it should, if possible, be destroyed by heat or buried in sandy soil surrounded by lime to prevent the access of worms to it. By taking these precautions many attacks of anthrax have been cut short at the commencement. Further than this, Pasteur has placed in the hands of agriculturists a simple method of protective inoculation by means of which animals are rendered immune to the disease for at least a year. Now the importance of such preventive measures to us lies in the fact that nearly all cases of anthrax in man are contracted from the lower animals, so that all precautions which lessen the frequency of the disease among animals will also tend to make it a rarer disease in man. By far the most important disease with which we have to deal in comparative pathology is tuberculosis, and happily our knowledge of the nature of it, and the various ways in which it may be spread, has advanced very greatly during the last twelve years. The most important part of this work was done by Koch, who demonstrated the presence of the tubercle bacillus in all forms of tuberculosis, and proved its causal relationship to the disease. This discovery at once led to a scientific classification of all tuberculous diseases, and it was proved that apparently different processes were all the result of the same infective agent, the tubercle bacillus, and so were all forms of tuberculosis. We have yet much to learn about the accessory factors which influence the kind of tuberculous disease which develops. The primary seat of infection, the number and virulence of the invading bacilli, the degree of natural resistance of the patient, the state of nutrition of his tissues, and the nature of his surroundings may all play an important part in determining the particular form of tuberculosis which is developed when the bacilli gain access to the body. Tubercle bacilli generally develop locally at the beginning in the part of the body in which they have been first deposited. Thus, if the primary inoculation takes place through a wound in the skin a tuberculous wart or a patch of lupus may be the result. A good example of this is the case of a medical student who was engaged in examining sputum for tubercle bacilli. He had an irritable scalp wound at the time, which he frequently scratched with his fingers; the wound thus became infected with tubercle bacilli, and lupus developed there not long afterwards. If tubercle bacilli are mixed with a guinea-pig's food it develops tuberculosis of the intestine. This is an important fact to remember in the treatment of cases of phthisis, for tuberculous ulceration of the intestine is caused by swallowing expectoration containing tubercle bacilli, so that we should be careful to tell all our phthisical patients to avoid this danger. Tuberculosis is a common disease in cattle, and when a cow has tuberculous disease of the udder the milk is often found to contain large numbers of tubercle bacilli. Such milk, if taken unboiled, does no doubt not infrequently infect young children with abdominal tuberculosis, and is, of course, unfit for food. There is also experimental evidence to show that if a cow has an apparently healthy udder, but tuberculosis of some other part of the body, the milk may contain the bacilli; but opinions differ as to the amount of danger which arises from such cases. The question as to the danger from eating meat from tuberculous animals still requires further investigation. A Royal Commission has been examining these very questions and we must await the publication of the report for further information on this subject. Experiment has shown that tubercle bacilli in milk can be killed by boiling for a few minutes, or even by heating the milk to 85°C. for five minutes. If all milk the source of which we are not able to trace is boiled before it is used the danger is avoided. A greater source of danger than food infection is infection by the respiratory organs, the path by which the bacilli have entered in most cases of phthisis. It has been proved by experiment that if an animal is made to inhale air in which tubercle bacilli are floating the lungs become infected. The source of infection in man is in most cases the dried expectoration of patients suffering from phthisis, which often contains enormous numbers of tubercle bacilli, and if it dries crumbles into dust, which floats about in the air. The bacilli can retain their vitality for some time in this dried condition and if they are inhaled by any person who forms a suitable nidus for them he runs a risk of contracting phthisis. This drying of tuberculous sputum takes place if it is deposited on the floor or in a handkerchief. In this way a bedroom may easily become infected by a handkerchief which is pushed under the pillow for use during the night. The proof of all this lies in the discovery made by Cornet that tubercle bacilli are present in the dust of rooms which have been inhabited by persons suffering from phthisis. This discovery of the means by which phthisis is spread is one of the most important discoveries in preventive medicine of this century. Cholera and other epidemic diseases only visit us occasionally,

but tuberculosis is with us always, and is said to cause at least one seventh of the total number of deaths which occur annually in Europe. Reforms are unfortunately brought about slowly, and as yet the rational means of preventing the spread of phthisis are by no means adopted in this country to the extent they should be. The precautions which are really necessary are very simple. The main point is to prevent the drying of the expectoration before it has been disinfected or safely disposed of. This end is readily attained if patients make an absolute rule of always expectorating into a vessel containing water or some disinfectant or into a piece of paper which can be burned at once. It is well to remember that some tubercle bacilli must remain adherent to the lips of a phthisical patient after expectorating, so that all spoons and cups should be immersed in boiling water after use, and kissing should be avoided. If these precautions are taken and the patient sleeps alone he can still live with his people without danger to them. If he dies or changes his room it should be disinfected, and all sanitary authorities should be prepared to disinfect such infected rooms just as they do after cases of scarlet fever. In order that these precautions may be efficiently taken it would be a great advantage to have phthisis included among the diseases which have to be notified to the medical officers of health.

The discovery of the tubercle bacillus has rendered a most important service to general medicine in providing us with the means of making a certain diagnosis in many early cases of phthisis in which the symptoms and physical signs are not sufficiently well marked to justify us in giving a decided opinion. The examination of expectoration for tubercle bacilli is easily carried out, and in many cases does not take more than five minutes. It should be made a part of routine practice just as much as the examination of the urine for sugar and albumen. The discovery of the bacilli in the expectoration at once shows that the patient is suffering from phthisis. The great importance of this is obvious. It enables us to at once take precautions to prevent the spread of infection to others, and it enables us to adopt a decided line of treatment at an early stage of the disease, when it has the greatest opportunity of doing good. Asiatic cholera has a special interest for us at present, as it appeared in England during last autumn. Happily it only assumed a sporadic form. In cases of cholera the comma bacillus or spirillum as it is in its fully developed form is to be found; but it does not occur in other diseases. It can be cultivated in a pure condition for successive generations. On several occasions a true attack of cholera has been brought on in man by swallowing the bacilli. A striking instance occurred in Koch's laboratory a few years ago. A medical practitioner, who was working with cultures of the cholera bacillus at the time, was seized with symptoms of cholera. Some of his discharges were examined by Koch, who found that they contained the comma bacilli. As there was no other case of cholera in Germany at the time it is evident that the attack was brought on by swallowing some comma bacilli from neglect of the rules of the laboratory for proper disinfection of the hands. A similar case occurred last autumn in Berlin, and, as it happened, the serum of this practitioner's blood had been examined as to its power of conferring immunity to cholera upon a guinea-pig about a year previously. Six weeks after the illness, during which the bacilli had been found in his stools, the protective power of the serum was found to have been increased more than a thousand times, just as it is after many attacks of natural cholera. Thus we have strong evidence of the causal relationship of the bacillus to the disease. Acting on this conclusion we rely on the presence of the comma bacilli in the stools rather than on the symptoms of the case in making our diagnosis of a case of cholera. The symptoms of cholera are often indistinguishable from those of English cholera or some cases of poisoning, so that it is a great advance in medicine to have a definite test, just as we have for the presence of tuberculosis. During this autumn I was able to detect the presence of the comma bacillus in eight cases which had suspicious symptoms in Northumberland and Durham. Every precaution was taken in these cases, and, happily, the disease spread no further.

Among the diseases which attack both man and the lower animals none have excited more interest than those two infective processes which often manifest their presence by causing over-action of the motor nerve centres, and, in consequence, severe muscular spasms. I refer to tetanus and rabies. Tetanus has been clearly recognised as a definite disease for more than two thousand years, and we possess no better example of the brilliant powers of observation possessed by Hippocrates than his descriptions of cases of traumatic tetanus. Let me give you his description of one of his cases. "The captain of a large ship, who had the index finger and the bone of the right hand crushed by the anchor, was seized with inflammation, sphacelus, and fever. He was moderately purged on the fifth day, the heat and the pain diminished, and a small portion of the finger separated. After the seventh day a passable fluid was discharged; he complained of his tongue, saying that he was not able to articulate properly; the prognosis was opisthotonos. The jaws were firmly clenched; then the neck was attacked; the third day the whole body was contracted backwards and sweated. The sixth day after the prognosis he died." Experimental research has now shown us that it is a traumatic infective disease caused by a specific bacillus. These bacilli, or their spores, are found in garden earth, in the mud in streets, in horse dung, and in other situations. They require certain conditions, such as the exclusion of oxygen and a suitable nutrient medium and temperature for their growth. When such conditions are realised, as, for instance, in a contused wound, they find a suitable nidus in the damaged tissues, which provide a suitable nutrient medium at the right temperature. Here they are shielded from the oxygen of the air by a layer of pus, and from the oxygen of the blood by a layer of damaged tissues, in which the blood flow has been arrested. They do not spread into the circulation, but the poisons which are produced by the bacilli enter the blood stream and act on the nerve centres, setting up the violent muscular spasms which are so characteristic of this disease. Here we have to deal with a local infection and a general intoxication. Infection thus implies the presence of a living poison, intoxication of a chemical poison. Experimental research has found a means of treatment for tetanus which bids fair to be a great success. It has been found that by a special method it is possible to confer immunity against tetanus. From the blood of animals thus prepared a substance can be separated which apparently acts as a direct antidote to the toxines which are present in the blood during an attack of tetanus. This has already been used successfully in a considerable number of cases. In this disease, then, within a few years experimental research has been able to reveal the causation and true pathology and to provide a cure, whereas during the preceding 2000 years our real knowledge of its nature had scarcely advanced at all. In the case of rabies the incubation period is sufficiently long to allow time for a course of preventive inoculations to make the patient refractory to the disease before it has time to develop the symptoms. Now, in spite of all that has been said against Pasteur's treatment for rabies, the fact remains that by its means the mortality of persons who have been bitten by animals which were really suffering from rabies has been reduced from 15 per cent. to less than 1 per cent. In five years 7925 such persons were treated in Paris alone, and only 73 died. At the lowest computation 12 per cent., or 951, would have died without the treatment. Thus more than 800 persons were saved from a terrible death in the course of five years. Do we know of any treatment for an acute infective disease, otherwise inevitably fatal, which can show results to compare with these? We have a very simple means of preventing the spread of this disease, for the bite is generally inflicted by a dog, though cats, horses, foxes and wolves may also be sources of infection. The muzzling of all dogs and the destruction of all stray dogs, combined with proper regulations to prevent the importation of the disease from other countries, have succeeded in stamping out the disease in Scandinavia and in greatly diminishing it in Germany. In Australia rabies is unknown, and so far strict regulations as to the importation of dogs have succeeded in keeping it out of that continent altogether. In Great Britain we are very favourably placed for getting rid of the disease and keeping free from it afterwards. Unfortunately no government has as yet undertaken the necessary steps, so that we still have it with us. In 1885 no less than twenty-seven persons died from rabies in London alone. Something certainly has been done by the application of proper regulations in some districts to diminish the frequency of the disease, but to really get rid of the disease they must be applied simultaneously all over the country. Other illustrations of my subject might be given from typhoid fever, diphtheria and other diseases, but I trust that those which I have selected will serve to show that the sciences of medicine and hygiene are receiving constant additions from careful

experimental research, which at the present time is going on more actively than ever. The future is full of promise, and we shall, year by year, acquire more rational and efficient means for the prevention and treatment of disease.

TWO CASES OF OPERATION FOR PERFORATED ULCER OF THE STOMACH.

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IN all new operative procedures it is eminently desirable that every case should be recorded, those cases which have failed as well as those which have been successful. Had this practice been loyally obeyed it is highly probable that the correct estimate of not a few operations would have been arrived at sooner and with the avoidance of much suffering. I desire, therefore, to publish two cases in which the attempt was unsuccessfully made to close perforated ulcers of the stomach, and for the guidance of others to point out the difficulties which beset the operation, that we may either learn how to avoid them in future cases or frankly recognise that they offer an insuperable bar to success.

CASE 1.—On May 27th, 1893, I was desired by my colleague Dr. Lees to see with him a young woman twenty-five years of age who had been admitted to St. Mary's Hospital on the 26th. She had been subject to indigestion for several years, had often been sick, and had once brought up stuff described as having the appearance of coffee-grounds. On the evening of May 25th she was suddenly seized with sharp pain, after having sneezed, in the left hypochondrium, at a point immediately below the false ribs, a couple of inches from the middle line. From that moment she was quite unable to work and the pain gradually spread over to the right side of the abdomen. When admitted to the hospital her temperature was 100 5° F., and the pulse and respiration were 124 and 44 respectively. Dr. Lees saw her on the 27th at midday, and then he noted that her pulse was 156 and of a running character, that she complained of pain all over the upper part of the abdomen, and that there was marked dyspnœa. The abdomen was motionless in breathing, tender all over, and, except slightly in the left flank, everywhere distinctly resonant. The temperature was not higher than before. Having come to the conclusion that a stomach ulcer had probably become perforated, he asked me to see her with a view to operation. His diagnosis appeared to me practically certain, for the fact of resonance over the hepatic area conclusively indicated that there was air in the peritoneal cavity. The patient was accordingly prepared at once for operation. I opened the abdomen in the middle line above the umbilicus and gave immediate vent to a rush of flatus. This was followed by the welling of a large quantity of thin, brown fluid. As much as possible of it was mopped up with sponges, and with sponges the peritoneal cavity was protected from further extravasation. I then explored the surface of the stomach and soon alighted upon the hole, which was large enough to admit the tip of the forefinger. It was on the anterior surface, exactly below the spot which she had pointed to as the seat of pain when she was first seen. Fluid of the same character as that already observed flowed freely from the opening and was directed outside the abdomen. When the flow had ceased the perforation was noticed to be surrounded with thick flakes of lymph. Some of this was removed, and I then scraped the margin of the ulcer with a Volkmann spoon and closed it by a continuous suture passed through the coats. By means of seven Lembert sutures passed into the muscular coat the portion of stomach which held the perforation was next enfolded so that peritoneum came to lie in apposition with peritoneum. A good deal more lymph of a nasty yellowish-grey colour having been peeled from the stomach, and sponged out from the region between the stomach and the diaphragm, the general cavity of the peritoneum was cleansed with hot boracic solution. The abdominal wound was closed in the usual way by tiers of sutures. The patient soon rallied and for twenty-four hours was decidedly easier, but on the following afternoon the temperature, pulse, and respiration all began to rise and she rapidly became worse. She died thirty-four hours after the operation and seventy-nine after the perforation had occurred. From the notes of the necropsy by Mr. Clarke we learn as follows: "The anterior wall of the stomach was united rather firmly to the left lobe of the liver by recent lymph, and less firmly to the abdominal wall, The sutures in the stomach were hidden from view by lymph. On injecting fluid into the stomach under considerable pressure not the slightest leakage was found at the site of the ulcer, and the sutures seemed to be completely satisfactory. The ulcer was on the anterior wall two inches below the lesser curvature and about midway between the cardiac and pyloric ends. It was situated amongst thick inflammatory tissue which would have made it impracticable to excise the adjoining parts of the stomach wall. There was a thin coating of yellowish lymph on the surface of the left lobe of the liver, but the intestines themselves were shining and free from lymph." The only remark I have to make about this case is that after the operation was over I felt that the work of passing the sutures would in all probability have been less difficult had the abdomen been opened below the ribs, over the site of the first pain, instead of in the middle line, and I resolved that in any future case I would open there, should the complaint of pain be as precise as in this instance.[1] It was satisfactory, however, to learn at the post-mortem examination that the suturing had been so far successful as to prevent further leaking from the stomach, but the condition of the walls at the seat of suture makes me feel considerable doubt as to the possibility of the closure being permanent had the girl lived, Her death was clearly due to the general peritoneal infection, and it seemed to us all that had the opportunity only arisen of operating at an earlier period there might have been a chance of saving her life. I hoped that my next case would be more fortunate in this respect, and that the invasion of the peritoneal cavity might not have gone so far. The second case appeared in every way more favourable, but it will be seen that insuperable difficulties impeded the work of suture and rendered success impossible.

CASE 2.—A girl sixteen years of age was admitted to St. Mary's Hospital on the afternoon of Oct. 21st, 1893. She had been suddenly seized only a few minutes before with acute pain in the left hypochondrium. Up to this time she had no idea that the pain which she had suffered for three months after food was due to anything more serious than indigestion. She gave a somewhat uncertain account of having once vomited blood, but she had not been under medical care. She turned faint at the moment she was seized with pain, but soon rallied, and a medical man who happened to be near at hand when she was taken ill despatched her at once to the hospital. When she arrived she was without pain or other sign of distress, and the only noticeable thing was her extreme anæmia. On the following morning her abdomen was distended and her temperature had gone up to 100° F. At 1 P.M. it had risen to 102°, and her pulse had become much more frequent, but she was not in any great pain. Dr. Sidney Phillips saw her at this time, and found the abdominal movements distinctly impaired, decided tenderness under the left ribs, and a tympanitic percussion note both here and in the epigastric region. He came to the conclusion that there had in all probability been a perforation of the stomach and suggested that a surgeon should be sent for. I saw her accordingly at 3 P.M., and her history and general condition, which seemed to me then extremely grave, led me to the same conclusion, and I advised immediate exploration. Preparations having been made as soon as possible, I opened the abdomen by a three-inch incision, two inches to the left of the middle line immediately over the point where she had been seized with pain and where there was now the greatest tenderness. Flatus escaped directly, and from the neighbourhood of the stomach large quantities of thin green sour-smelling fluid. It was obvious that this fluid was confined to the epigastric and hypochondriac regions, but if there were any adhesions they were so delicate as to break down with the least touch, and it was needful to protect the general peritoneal cavity by arrangement of sponges. Exploration with the finger soon led to the discovery of the orifice in the stomach, at a point on the anterior surface close to the lesser curvature and not more than two and a half or three inches from the cardiac end. It was almost out of reach, and it was necessary to prolong the abdominal incision, both upwards and downwards, in the upward

[1] To do so, however, would be in opposition to the experience of Dr. Mackenzie who points out in his paper "On the Association of Sensory Disorders and Visceral Disease" (Brain, vol. lxiii), that site of ulcer and surface pain do not correspond in position.