

obstruction even in two patients where I had to deal with troublesome intestinal adhesions connecting the parietal peritoneum with the surface of the tumour, the result of a former exploratory operation.

Lastly, in two operations for fibroid I discovered a tumour almost fixed, with a prominent lobe closely resembling in form and position the right lobe or tumour in the case which I now publish. In each instance there was a firm adhesion which, as in the present case, was situated immediately posterior to the upper limits of the tumour. In one of the two cases it was an appendix epiploica, in the other several inches of ileum that adhered to the projecting lobe. Still, though the adhesion formed an arch under which intestine might readily have become incarcerated or even strangulated neither of the two patients had ever suffered from any symptoms indicating obstruction. My experience, however, at least shows that a lobe projecting prominently upwards and widely separate from the remaining part of a more or less fixed uterine fibroid is liable to contract adhesions which in one out of three cases caused intestinal obstruction. Granville-place, W.

CANCER INFECTION AND CANCER RECURRENCE: A DANGER TO AVOID IN CANCER OPERATIONS.

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SURGEONS who see much of cancer cases and who are frequently called on to exercise their skill in endeavouring to relieve or to cure patients of this malady have sometimes every reason to be disappointed with the results of their efforts. Perhaps an operation both ingenious and extensive is planned and carried out, the operator taking what he considers to be every due precaution to eradicate the disease. Yet in spite of all this care the patient subsequently develops that bugbear and disappointment of all surgeons—viz., recurrence. What is the explanation of this failure? We have been taught that where recrudescence takes place after a surgical operation for cancer this misfortune is due to an inadequate operation—i.e., one where the surgeon has failed, or was unable, to cut sufficiently wide of the disease. This cannot be the only reason in all cases and therefore we must seek for another. Now, our present knowledge of cancer teaches us that the trouble begins as a primary growth, that its elements then tend to invade the tissues around this growth, spreading their way through the neighbouring lymphatic system, and infecting the nearest lymphatic glands. Therefore, any adequate operation must entail excision of the growth and the possibly infected surrounding tissues. Hence we endeavour to cut wide of the primary disease, cutting into healthy tissues some distance around the growth and, at the same time, removing possibly infected lymphatic vessels and glands. We carry out such an operation because we know that for the success of any radical surgical procedure it is necessary to remove every vestige of the growth. Therefore, if the disease recurs somewhere near, but at the same time outside, the immediate field of operation it is only natural to infer that this recurrence is due to the surgeon having failed to cut sufficiently wide of the disease.

Again, one frequently sees cancer reappear in some distant organ, without any local post-operative recurrence: for example, cancer of the liver sometimes manifests itself after excision of a cancerous breast. In a case such as this it is only very obvious that in spite of the surgeon's efforts the disease had got beyond the bounds of surgical removal at the time of excision of the primary focus of infection and the surgeon, therefore, was unable to cut sufficiently wide of the disease. However, where the disease reappears within the field of operation, this reappearance, though sometimes, yet is not always satisfactorily accounted for by the argument of inadequate operation. Such also is the fact in those cases where, after the attempted removal of cancerous tissues, the disease not only appears locally but sometimes seems to recur with increased fury and virulence, in fact, in cases such as the latter, instead of the patient being relieved by the operation, it seems as if one had stirred up a hornet's nest, the post-operative history showing the disease recurring in and around the wound with extraordinary virulence and in

an alarming extent, the virulence of such recurrences sometimes being so intense as to appear almost like some inflammatory malignant disease. As an explanation, therefore, of some cases where cancer recurs within the field of operation and likewise where it recurs there with increased virulence and extent one has to seek for another cause apart from inadequate operation. It is my conviction that such a cause is satisfactorily found and explained by the process of cancer infection or accidental infection of the wound by cancer cells at the time of operation. Our whole knowledge of the disease shows how very infective is the cancer cell. In the parent growth it multiplies indefinitely, and whether it be carried by the lymph or blood streams to other parts of the body there it again displays great vitality and activity, as is manifested by giving rise to secondary growths. Therefore it is not only the cells in the parent growth which are a source of danger, but also any which escape from the same by the lymph or blood streams. This is so well recognised that all radical operations are planned and executed with a view of removing all and every fragment of cancer material, because the surgeon knows that for the success of any radical operation it is necessary to remove every vestige of the growth or vestige of infection. Should he fail to do so infection persists and recrudescence of the disease inevitably takes place.

Now, if the cells in the parent growth are such a source of cancer infection, and thereby such a source of danger that any which escape in the ordinary clinical course of the disease and become disseminated through the channels above mentioned are so capable of, and liable to, start fresh secondary cancerous growths, can there be any reason to disbelieve that cancer cells which escape at the time of operation and find their way into the open wound, are an equal source of danger? Certainly there can be no reason to disbelieve that these liberated cells are capable of becoming implanted in the wound and developing into fresh malignant growth. I am quite convinced that in carrying out radical operations for cancer this form of cancer infection is one of fairly frequent occurrence and its avoidance is therefore one of vital importance. Cancer cells may escape during operation as the result of incising or lacerating the primary growth, cutting across or tearing an infected lymphatic vessel, or even from rupture of a cancerous gland, and such cells getting into the wound are quite capable of causing, and do frequently cause, cancer recurrence. This is cancer infection, or cancer implantation, and its clinical importance with regard to the causation of cancer recurrence is, in my opinion, insufficiently recognised at the present time. I do not wish to say that many surgeons are not suspicious of or aware of this danger, but I do not believe that sufficient importance is attached to it in clinical teaching of the present time.

If one wished for further evidence as to the infectivity of the cancer cell and the readiness with which it becomes implanted one has but to look at the clinical course of the disease in the abdomen. Operators of even limited experience cannot fail to be impressed with the widespread dissemination of the disease which is so frequently found within the peritoneum. Perhaps the primary growth is in the ovary, and yet countless secondary growths of various sizes are found widely scattered over the peritoneum, both visceral and parietal, and, in fact, the dissemination of the disease may be quite as widespread as that found in peritoneal tuberculosis. The cause of this diffuse dissemination can only be explained by the fact that the cancer cell is highly infective and capable of implantation in circumstances which are perhaps particularly favourable to its growth in the abdomen. One therefore concludes that once cancer cells become parted from the parent growth and set free in the peritoneal cavity they are carried about by the movements of peristalsis, or even by the force of gravity, or perhaps their movements are aided by the presence of ascitic fluid, which is so frequently found in these cases. Thus these cells become carried from the parent growth to other parts of the peritoneum, where they become implanted, take on active growth, and cause this widespread infection. The peritoneal cavity is not the only part of the human frame which so palpably manifests the infective nature of the cancer cell, but it is the commonest. Therefore, if these cells are capable of implanting themselves wherever they happen to rest in the abdomen one can readily see that there must also be a similar proneness for liberated cells to implant themselves in an operation wound. This readiness to implantation must have a most important bearing on cancer recurrence and the success or failure of an operation. The extent of cancer infection in the peritoneum

varies in different cases, and is not always dependent on the magnitude of the parent growth, but is probably dependent on the amount of cancer cell dissemination. Sometimes large growths are met with without any apparent peritoneal infection, and this is probably explained by the fact that the cancer cells are still confined within the primary tumour and no escape has taken place. Yet, on the other hand and for the reverse reason, extensive peritoneal infection may be found with only a small primary growth, infection which in extent appears to be out of all proportion to the parent growth.

Now, once cancer cells become liberated in the abdomen there is a large cavity open to them for infective dissemination. You can compare the extent of this cavity with the extensive wound which is so frequently made in order to carry out a radical operation for cancer and the possible risks run if cancer cells are liberated at the time of doing so. Should cancer cells become implanted in an operation wound fortunately they ought not generally to cause the same widespread dissemination as is seen in the peritoneum. Once they come to rest they become fixed by blood coagulation, and, for a time, held fast by the process of healing. Moreover, they have nothing similar to peristalsis to facilitate their dissemination, nor yet a cavity full of ascitic fluid in which to float about. They ought, therefore, simply to give rise to isolated recurrences, and this they probably do; hence recurrence so frequently taking the form of nodules in and around the scar of operation wounds. On the other hand, there are some cases where, doubtless owing to extensive implantation, diffuse and widespread recurrence takes place. I am a confirmed believer in cancer infection from accidental inoculation of the wound being a common cause of the failure of many of our radical operations, and I again emphasise the fact that such a danger cannot be too carefully guarded against. Doubtless cancer infection of wounds occurs much more frequently than we imagine, but it is difficult to prove every case owing to the uncertain time recurrence takes to manifest itself. In some cases it may appear almost immediately, whereas in others it is only seen after the lapse of several years, and yet cancer cells are present all the time. The following cases which have from time to time come before my notice, chiefly at the Cancer Hospital, illustrate the points to which I wish to draw attention in connexion with the danger of cancer infection.

A. Cases in Connexion with Cancer of the Breast.

CASE 1. *Widespread and rapid infection of the chest-wall, following exploratory incision of a cancerous tumour, preliminary to amputation of the breast.*—The patient was aged 46 years. A small tumour was noticed in the right breast for two months. On August 30th, 1895, an exploratory incision of considerable extent was made into the tumour and down to the pectoralis major. The tumour proved to be carcinoma, so the breast with the axillary lymphatic vessels and glands were removed *en masse*. At first a few nodules appeared, but within eight weeks the whole side of the chest in the neighbourhood of the operation wound became one diffuse mass of cuirasse cancer which ran a very rapid and virulent course.

In this case the scalpel with which the tumour was first incised was employed to carry out the complete operation and the exploratory incision was not closed to prevent the escape of cancer cells, nor were the surgeon's hands again prepared. Microscopically the growth was duct carcinoma. The post operative course of this case made a great impression on me and I was forced to believe that the large wound left after amputation of the breast had become infected with cancer cells which escaped from the exploratory incision or were carried to the wound by instruments or by my hands.

CASE 2. *Suture hole infection and cancer "en cuirasse" following amputation of a cancerous breast*—A patient of Dr. J. Smyth, aged 57 years was operated upon on Jan. 10th, 1905, for a tumour of six weeks' duration. An exploratory incision was made, but before carrying out amputation the exploratory wound was closed and every reasonable precaution was taken to avoid cancer infection of the amputation wound. Unfortunately, there was reason to believe that the measures which were adopted were not perfect and that there was some escape of blood from the exploratory incision during removal of the breast. Subsequently this patient developed well-marked nodules in the site of the suture holes on both sides of the lower half of the wound, and later secondary nodules appeared in the surrounding area, the whole eventually coalescing and at first forming a localised but later a diffuse cancer *en cuirasse*. This gave me the impression that the needles or suture became contaminated with cancer cells, hence the suture hole infection, and that the latter gave rise to the secondary nodules.

Microscopically the growth was glandular carcinoma.

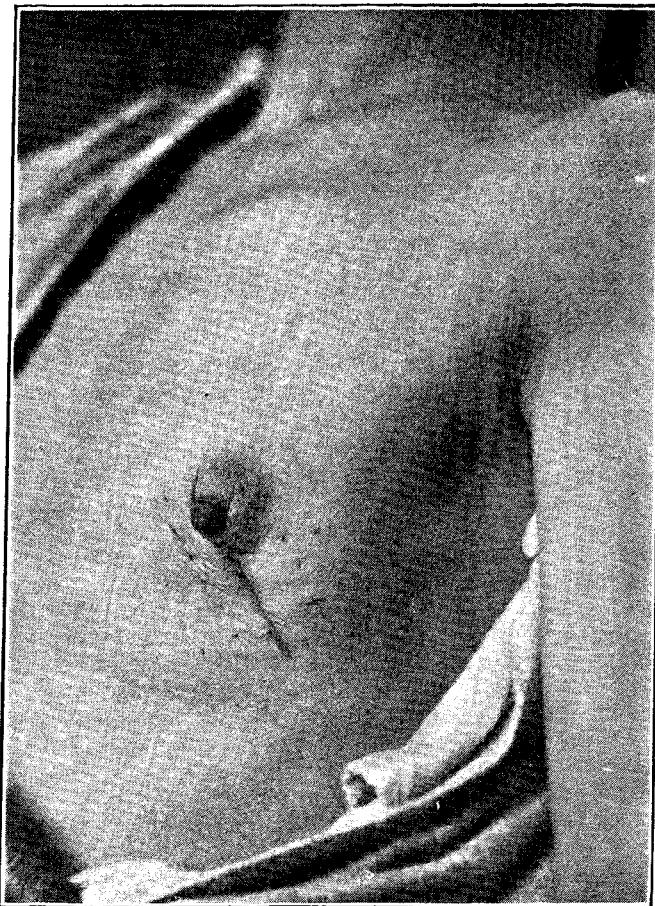
CASE 3. *Multiple suture hole infection following excision of a mammary tumour.*—The patient, aged 39 years, had the right breast amputated by me in June, 1898, and came to the Cancer Hospital again in June, 1901, suffering from a small tumour in the left breast.

One of my colleagues excised the tumour, believing it to be non-malignant, but it proved to be cancer. In May, 1902 she was seen by me and then had nodules in the site of several of the suture holes on each side of the scar in the left breast. The whole breast was therefore removed.

Microscopically all growths proved to be glandular carcinoma.

CASE 4. *Single suture hole infection following removal of a mammary tumour (Fig. 1).*—The patient, aged 25 years, had a tumour excised from the left breast in another hospital in December, 1906. She came to the Cancer Hospital in February, 1907, with a depressed scar radiating from the nipple. No mammary tumour could be felt but

FIG. 1.



Single suture hole infection following excision of mammary tumour. The infected suture hole is marked.

one of the suture holes proved to be the site of a well-marked nodule which convinced me that the original tumour was malignant. These suspicions were strengthened by the fact that the glands of the corresponding axilla were perceptible.

The breast was therefore amputated and the axilla cleared and the microscopic examination later revealed the fact that the nodule in the suture hole contained evidence of duct carcinoma.

Cases 2, 3, and 4 speak for themselves and seem convincing proofs of the readiness with which the cancer cell can become implanted and the danger of the needle or suture being infected with cancerous material.

CASE 5. *Diffuse nodular infection of the chest wall following attempted removal of a solitary cancerous nodule (Fig 2).* A woman aged 60 years, a patient of Dr William Barkley, had the left breast removed in December, 1895 and had several subsequent operations for recurrence, the last being in July, 1901. When I saw her in May, 1906, there was a small nodule over the second costal cartilage, and it seemed to be adherent to the latter. Its removal was attempted, and thinking that a resection of a portion of rib might be necessary I turned back a semilunar-shaped flap of skin. The nodule was removed without any resection being considered necessary. Later multiple nodules appeared, some 14 in number, and they made their appearance only beneath the flap and in the line of the curved cicatrix, and nowhere else. The natural inference is that in removing the original nodule some cancer cells became liberated and thus infected the wound. These fresh nodules of infection were still confined to the same site one year after operation.

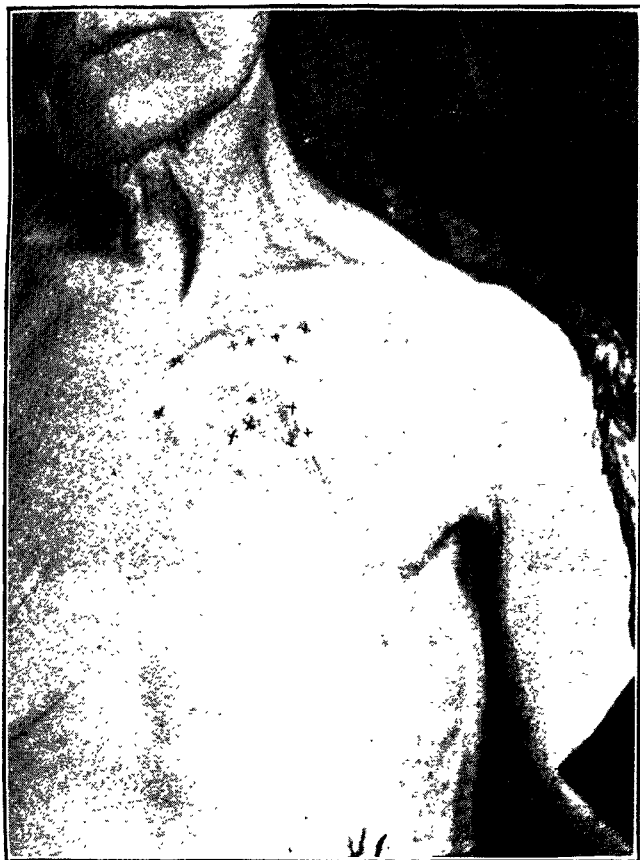
Microscopically the growths were glandular carcinoma.

CASE 6. *Infection of drainage-tube and suture holes after amputation of the breast (Fig 3).*—A woman, aged 49 years, a patient of Dr. L. S. McManus, had the left breast removed by me on Dec. 5th, 1906, for advanced carcinoma, and the wound was drained by a tube inserted through an opening made in the posterior axilla. Three months later she showed evidence of nodules in some of the lower suture holes, and four months after operation a well-marked cancerous nodule

appeared in the site of the drainage-tube hole. Cancer cells must have been liberated during operation in this case, either by instruments or otherwise, and caused infection of both suture and drainage-tube holes.

Microscopically the growths were glandular carcinoma.

FIG. 2.



Diffuse nodular infection following attempted removal of a solitary cancerous nodule. The multiple nodules are marked. The original nodule was under the middle of the flap.

CASE 7. *Infection of the clavicle following its division during removal of cancerous supra-clavicular glands.*—A woman, aged 53 years, had the right breast amputated on April 11th and some supra-clavicular glands excised on June 25th, 1906. In order to facilitate removal of the glands the clavicle was divided. After healing of the wound some thickening persisted in the clavicle, and this was believed at first to be the result of callus. About January, 1907, the bone was noticed to be considerably thicker, and it has gradually enlarged ever since, so much so that when last seen it was causing severe symptoms from pressure on the brachial nerve trunks and blood-vessels, and no other explanation can be given except that this progressive enlargement is due to cancerous deposit in the bone. As this development has taken place since the operation it leads one to believe that it undoubtedly is due to infection of the clavicle at the time of operation.

Microscopically the growth was glandular carcinoma.

It is not only in association with the breast but also in other parts of the body that cancer infection has been brought before me. Perhaps in the neck more than any other part have I seen changes so frequently occur after operation which could only be explained by cancer infection. I need not mention all the cases I have seen, but will give those showing various proofs of cancer infection.

B. Cases in connexion with Cancer of the Tongue, Lip, Larynx, Maxillary Antrum, and Ear.

CASE 8. *Diffuse infection of the neck following exploration of a tumour of doubtful origin.*—Some years ago I had a middle-aged man under my care in the Cancer Hospital, but I am unable to trace his notes. He was suffering from a tumour of about the size of a Tangerine orange and situated in the anterior triangle of the neck. As there was evidence of fluctuation and some doubt existed in my own mind as to the nature of the swelling, the latter was incised, when some fluid containing much debris escaped. The cavity was vigorously curetted and some of the debris saved for microscopic examination. It proved to be an epitheliomatous growth, evidently of primary origin. The case never did well and within a few weeks of operation there was diffuse brawny thickening of the whole side of the neck. This soon broke down in several places and gave every evidence of the thickening being malignant in origin. It was a case of diffuse cancerous infection and I concluded that in using the curette I had opened up fresh channels for infection.

CASE 9. *Diffuse infection following incision and curettage of breaking-down cancerous glands.*—A patient, aged 45 years, had the tongue removed in March, 1904, for epithelioma. In January, 1905, he was re-admitted into the hospital with a swelling on the left side of the neck. The short history and presence of fluctuation made me disbelieve it to be malignant, so it was incised, curetted, and drained. The swelling proved to be breaking-down epitheliomatous glands, and diffuse and

rapid cancerous infection of the whole side of the neck followed operation. The condition became similar to Case 8, and followed an identical course, doubtless due to the same cause.

Microscopically the growth was epithelioma.

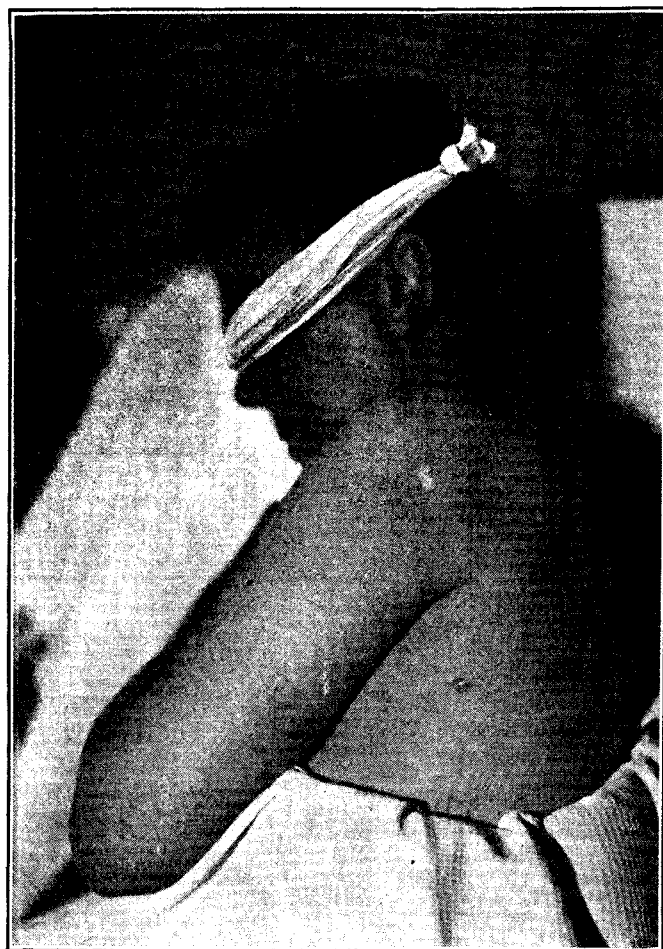
CASE 10. *Diffuse infection of the neck and floor of the mouth after excision of the tongue and removal of the submaxillary glands.*—A patient, aged 55 years, was admitted to the Cancer Hospital in August, 1898, suffering from epithelioma of the tongue. The tongue was quite moveable, there was no evidence of implication of the floor of the mouth, but some enlarged glands could be felt in the left submaxillary region. On August 23rd the tongue was excised and the enlarged glands were removed. The wound in the neck did not progress satisfactorily from the first, and four weeks after operation there was evidence of marked diffuse cancer infection, not only in the submaxillary wound, but extending through the floor of the mouth. This somewhat surprised me, as it was an unusual course for the disease to run, and I could only conclude that in removing the glands from the submaxillary region one of them must have burst, thus liberating cancer cells into the wound and thereby setting up this serious infection.

Microscopically the growth proved to be epithelioma.

CASE 11. *Extensive and rapidly fatal infection of the neck from removal of epitheliomatous glands.*—A patient, aged 59 years had the left half of the tongue removed for epithelioma in March, 1898. On July 2nd, some enlarged glands were removed from the left side of the neck, and they were ruptured during removal. On July 12th there was a suspicious thickening of the skin and deeper tissues at the site of operation. This had spread extensively, showing well-marked cancerous infection of the neck wound on August 2nd, by which date the disease was extensively broken down. The trouble ran a very rapid course, the whole wound opening up, revealing an enormous cavity, and the patient died from the disease on Oct. 27th, 1898.

Microscopically the growth was epithelioma.

FIG. 3.



Infection of drainage-tube hole after amputation of cancerous breast.

CASE 12. *Suture hole infection of the neck following removal of epitheliomatous glands (Fig. 4).*—The patient, aged 39 years had excision of the tongue carried out for epithelioma on August 2nd, 1906. On Nov. 28th enlarged cervical glands were removed on both sides, the operation presenting some difficulties owing to the adherence of the glands to the carotid sheath. In fact, I was somewhat suspicious that cancer cells might have been liberated during operation. The wounds healed perfectly. Two months after there were nodules in the site of the suture holes on both sides of the neck but chiefly on the left. On the right side there were four suture holes infected, two on each side of the incision and exactly opposite one another. On carefully examining them I noticed that the two outer nodules were on the surface and the two on the other side of the incision were in the deeper layers of the skin. It appeared as if the needle or suture infected the superficial layer of the skin as it passed through and then picked up fresh infection in the wound and brought this to the deeper layers of the skin on the opposite side.

CASE 13.—*Rapid infection of structures of the neck after exploration of carcinoma of the larynx.*—The patient, aged 33 years, had been suffering from hoarseness for some months. She was seen by Sir Felix Semon and Mr. Richard Lake, and an intra-laryngeal swelling was noticed in the neighbourhood of the left arytenoid cartilage but there seemed some doubt as to whether the trouble was tubercle or carcinoma. On March 30th, 1900, the larynx was explored through an incision on the left of the neck and a small quantity of some soft breaking-down material was met with. As much as possible was removed by the curette. The wound in the neck refused to heal and very soon gave evidence of being infected with carcinoma, eventually fungating and breaking down, the neighbouring structures becoming implicated for some distance round. In two weeks tracheotomy was necessary and owing to the invasion of the oesophagus gastrostomy became an absolute necessity and was performed four weeks after the primary exploration. The patient succumbed to the disease in four months as a result of hæmorrhage from a huge cavity in the neck.

Microscopically the growth was carcinoma. This was apparently an early case of carcinoma, and I have no doubt

FIG. 4.



Suture-hole infection following removal of epitheliomatous glands of the neck. The infected suture holes are blackened.

that cancerous infection of the exploratory incision, aggravated by the curettage, was the cause of its rapid and somewhat unusual progress.

CASE 14. *Rapid and extensive infection of the neck following removal of glands secondary to epithelioma of the lip.*—The patient, aged 55 years, under the care of Dr. McManus and Dr. H. C. Sturdy, was admitted into the Cancer Hospital in May, 1906, suffering from epithelioma of the left portion of the lower lip, with some enlarged glands in the left submaxillary region. The epithelioma of the lip was excised and the glands were removed, but unfortunately one of the latter burst during removal. The operation took place on May 2nd, yet on the 29th diffuse recurrence was well developed in the site of the submaxillary and cervical incisions and was even fungating. The disease spread rapidly and five weeks after operation the whole left side of the neck was involved in a breaking-down growth. An interesting point in this case was the fact that the man was seen by me five years previously and operation was then recommended, but he preferred to wait. This shows the chronic nature of the growth, and it is my opinion that owing to rupture of a breaking-down gland at the time of operation the diffuse and rapid carcinomatous outbreak was brought about by cancerous infection of the wound. This patient died on August 16th, 1906.

Microscopically the growth was epithelioma.

CASE 15. *Virulent infection of the parotid region following removal of a gland secondary to epithelioma of the ear* (Fig. 5).—A man, aged 48 years, a patient of Dr. R. Hugh Hodgson, was admitted to the Cancer Hospital in April, 1907, suffering from epithelioma of the ear and an enlarged gland in the parotid region. Operation was carried out on April 17th, the epithelioma of the ear being excised without difficulty but the enlarged gland at the angle of the jaw burst during removal. The wound in the neck did not heal satisfactorily and the patient left hospital on April 21st with some redness of the wound,

FIG. 5.



Diffuse infection of parotid region after removal of an epitheliomatous gland.

accompanied by discharge. The patient was seen by me again a month after operation and then there was great swelling in and around the wound in the neck, with brawny induration and breaking-down growth in the line of incision. This was followed by severe and repeated attacks of hæmorrhage, with further breaking down of the swelling. For the details of the after history I am indebted to Dr. Hodgson. The patient rapidly lost ground and is now confined to bed.

The post-operative history of the case is similar to Case 14 and I have no reason to assign the cause of the virulent infection of the wound to anything but rupture of the gland during removal. Prior to this accident the case ran a very

FIG. 6.



Nodule of infection in cicatrix of face following removal of superior maxilla.

chronic course, as the patient first noticed the growth in the ear in 1901.

CASE 16. *Nodule of cancer infection in a cicatrix of the face following removal of the superior maxilla* (Fig. 6).—The patient, aged 43 years, had the right superior maxilla removed on June 9th, 1906, for epithelioma of the maxilla. The operation was performed by turning back a flap of the soft structures of the face, making an incision following the lower margin of the orbit and inner margin of the nose, and dividing the upper lip. The wound healed well, but four months after operation a nodule appeared in the middle of the cicatrix of the face, and this gradually enlarged. The original growth of the maxilla was present at least two months before operation, beginning in the antrum and affecting the posterior portion of the maxilla. The soft structures of the face were, apparently, quite free from any sign of being implicated in the growth at the time of operation.

This case was probably a direct implantation of cancer cells on to the soft structures of the facial flap. Eight months after operation recurrence took place in the neighbourhood of the right half of the palate. Microscopically the growth was epithelioma.

C. Carcinoma of the Rectum.

CASE 17. *Diffuse infection following excision of the rectum*.—The patient, aged 50 years, had transacral excision of the rectum performed for cancer in February, 1905. The diseased portion of the bowel became torn during operation and its removal was effected with difficulty. Two months afterwards there was marked stenosis of the sacral anus, and on examination the stenosis extended for several inches up the bowel, which latter was surrounded by what proved to be diffuse carcinomatous infection, as if the bowel were imbedded in plaster of Paris. This became rapidly worse, necessitating colotomy, and the patient succumbed to the disease five months after operation. My opinion is that cancer cells were liberated at the time of rupture of the growth and that they caused this peculiar and unusual diffuse infection.

Microscopically the growth was glandular carcinoma.

CASE 18. *Localised infection of the wound following transacral excision of the rectum for cancer*.—A patient of Dr. T. F. Devane, aged 64 years, had transacral excision of the rectum carried out in August, 1905, and again the disease was torn during removal. Although the growth was from 3½ to 4 inches from the anus, circumstances deemed it inadvisable to perform end-to-end anastomosis, so a sacral anus was made and the lower segment of gut was excised down to, and including, the original anus. Although the lower 3½ inches of the rectum which were excised were quite healthy, yet when I saw the patient again, in May, 1906, recurrence had taken place and was breaking down in the line following the cicatrix of the lower portion of the wound where the excised rectum was quite healthy. The other part of the wound and the sacral anus were free from disease.

I had drained the operation wound by means of a tube passed up through the site of the original anus and lower rectum and my only explanation for recurrence occurring in this situation was that it was owing to cancer infection of the wound.

CASE 19. *Suture-hole infection following excision of the rectum* (Fig. 7).—A patient of Dr. R. S. Dickson, aged 32 years, had transacral excision of the rectum performed by me in December, 1900, a sacral anus being made. In this case the growth was much lacerated at the

FIG. 7.



Microphotograph of suture-hole infection after excision of rectum.

time of operation. In September, 1901, I saw the patient again and then she had a nodule in the skin over the lower end of the sacrum, close to the new anal margin, and undoubtedly occupying the site of a suture hole. This was also removed by operation.

The only reasonable explanation for the nodule in this position was that infection was carried there by needle or suture. Microscopically the growth was carcinoma.

D. Cancer in the Abdomen.

Some years ago I came across a patient suffering from a fungating growth in the right iliac fossa. It appeared to me somewhat unusual, and on going into his history I found that he had exploratory laparotomy carried out for what was diagnosed as appendicitis but that something different was found and the wound was closed without anything further being done. Up to that date I had never seen an intra-abdominal growth fungate externally. He said that the wound healed perfectly at first but later broke down and fungated. In the light of subsequent experience I have no doubt that this was a case of carcinoma in or about the cæcum and infection of the abdominal wound took place during the exploratory operation, thus accounting for the fungating growth that was present when I first saw the patient.

CASE 20. *Infection of laparotomy wound after ileo-colostomy for carcinoma of the cæcum*.—The patient, aged 66 years, had the abdomen opened in the right semilunar line on May 3rd, 1904, when carcinoma of the cæcum was found. The disease was too far advanced for radical operation, though an attempt was made to remove it. On account of symptoms of intestinal obstruction ileo-colostomy was carried out. The abdominal incision never looked satisfactory after operation, and almost immediately began to discharge a semi-purulent fluid. This was followed by induration in and about the wound, which broke down and showed every evidence of malignant infection, the disease rapidly forcing its way externally. Eventually a faecal fistula developed, the patient went gradually downhill, and died on June 20th of the same year.

Microscopically the growth was carcinoma.

CASE 21. *Infection of abdominal wound following exploratory laparotomy for carcinoma of the cæcum*.—The patient, aged 29 years, had exploratory laparotomy carried out in the Cancer Hospital on June 13th, 1906. The abdomen was opened in the middle line and, after separating adhesions, inoperable cancer of the cæcum was found, so the wound was closed again, one layer of through and through sutures being used. This case followed much the same course as Case 20, a faecal fistula developing in less than a month and the patient succumbing to the disease on Nov. 20th.

Microscopically the growth was carcinoma.

FIG. 8.



Microphotograph of section of nodule of infection in laparotomy wound following exploration of carcinoma of sigmoid flexure.

These two cases are somewhat similar in the position and nature of the growth and also in the post-operative history, although the abdomen was opened in a different place in each case. The laparotomy wound became the site of carcinoma, and I cannot find any explanation for this unless it were brought about by cancer infection. In Case 21 I was very suspicious that the infection began in the site of the sutures.

CASE 22. *Nodular infection of laparotomy wound following exploration in cancer of the rectum*.—A patient of Dr. McManus, aged 32 years, had laparotomy performed by a mesial incision on March 31st, 1903, when an inoperable growth of the upper rectum was found. In March, 1904, he was readmitted into the Cancer Hospital and had inguinal colotomy carried out. At this time it was noticed that he had a series of nodules in the original laparotomy cicatrix, and they appeared to have arisen in the site of the sutures. I am practically certain from the nature of these nodules that they were carcinomatous and that they arose as the result of cancer infection of the wound. The patient died at home some time afterwards and unfortunately no microscopic examination was made in this case, though all the clinical features were diagnostic of carcinoma.

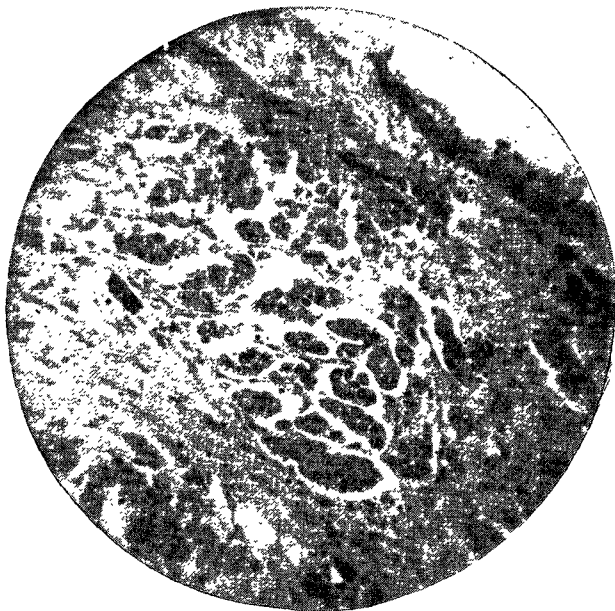
CASE 23. *Nodular infection of laparotomy wound in carcinoma of the sigmoid flexure* (Fig. 8).—A female, aged 26 years, a patient of Mr. E. J.

Pritchard, was operated on in the Bolingbroke Hospital in December, 1905, for recurring attacks of appendicitis. The abdomen was opened in the right iliac fossa and the appendix was found adherent to a cancerous growth implicating the sigmoid flexure. The appendix was removed, but it was found impossible to excise the growth, so ileo-sigmoidostomy was carried out to obviate the possibility of future intestinal obstruction. In December, 1906, a nodule was noticed deep in the abdominal cicatrix, and I found a second present in January, 1907. The patient died in May, 1907, and I am indebted to Mr. Pritchard for kindly securing one of the nodules for microscopic examination. This was examined in the pathological department of the Cancer Hospital, and was reported as being a cancerous nodule, secondary to carcinoma of large intestine.

In Cases 21, 22, and 23 cancer cells must have been liberated during manipulation of the growth and carried to the abdominal incision by the instruments, suture, or surgeon's hands. In Case 21 infection had only to be carried from the cæcum to the wound immediately over the growth. In Case 22 it was carried from the cæcum to a mid-abdominal incision, and in Case 23 the infection was conveyed from the left side of the pelvis to an incision in the right iliac fossa.

CASE 24. *Infection of needle-hole following tapping for cancerous ascites* (Fig 9).—The patient, aged 56 years, was admitted into the Cancer Hospital under Mr. F. Bowreman Jessett, on July 29th, 1906, suffering from advanced intra-abdominal carcinoma and well-marked ascites. The abdomen was tapped by means of an aspirating needle on July 30th and August 14th, when 11 and 4 pints of fluid were drawn off. On Sept. 8th she died and the post-mortem examination showed not only the abdomen extensively involved in malignant disease, with

FIG. 9.



Microphotograph of nodule of infection following tapping for cancerous ascites.

diffuse infection of peritoneum, but the pericardium and pleura were also involved. It was impossible to say where the disease primarily began. In the abdominal wall were two nodules of growth, microscopically of the same variety of carcinoma as that found in the abdomen, and, moreover, these nodules were at the exact spots of puncture where the abdomen was tapped.

I have mentioned how readily cancer infection takes place in the abdomen, but this case also demonstrates how the infection can sometimes be conveyed outside the abdomen.

CASE 25. *Nodular infection of laparotomy wound following abdominal hysterectomy for carcinoma* (Fig. 10).—The patient was a female, aged 40 years. Abdominal hysterectomy for carcinoma of the uterus was performed in the Cancer Hospital on March 23th, 1899. She was readmitted in May, 1900, suffering from symptoms of intestinal obstruction, and then it was noticed that there was a nodule of the size of a large filbert situated in the abdominal scar. Left inguinal colotomy was performed and the nodule was excised for microscopic examination. At the same time the posterior surface of the scar was examined. No adhesions were found nor were any other nodules present. In carrying out abdominal hysterectomy unfortunately the uterus was torn across at its junction with the cervix, and it is my belief that it was mainly through this accident that cancer cells were liberated and thus caused infection of the laparotomy wound.

Microscopically the nodule in the abdominal scar was identical with the original growth in the uterus.

CONCLUSIONS.

As the result of my observations on the above cases and not only on these but many others which I have refrained from quoting in order to avoid going over the same ground I have concluded that carcinoma is a highly infectious disease. Not that there is any evidence to support the fact of its communicability between one person and another, but that once an individual becomes the subject of cancer there is

not only the liability of it spreading by a well-defined infective process, but also in those cases where the surgeon attempts to remove the disease there is a risk of re-infecting his patient from the growth which he is endeavouring to remove. Cancerous infection of wounds is therefore of comparatively frequent occurrence, more frequent than is shown by my own experience, but unless the infection manifests itself fairly early the proof is easily overlooked. In the

FIG. 10.



Microphotograph of nodule of infection in laparotomy wound following hysterectomy.

cases which I have quoted infection shows itself in No. 24 very early, and in No. 23 comparatively late. Nevertheless, there is no reason to disbelieve that it might not appear many years later in other cases, as carcinoma has been known to break out again or recur after operation any time within a patient's lifetime. Cancer infection during operation is responsible for many of the cases of recurrent nodules in the site of operation wound and suture-hole infection is exceedingly common. In fact, a patient who came under my treatment quite recently asked me why it was that the disease always seemed to come back in the site of the stitches. Even she had noticed this peculiarity of the disease.

Cancer infection is also responsible for diffuse recurrent carcinoma taking place in operation wounds and especially in those cases where a general flare-up occurs after interference with a cancer growth. In fact, I regard cancer infection as the reason why chronic carcinomatous growths so frequently run a very acute course after attempted operations. In the parent growth the cells are, more or less, encapsuled in fibrous tissue, but some cells escape during operation and find a resting place in the wound which is comparatively unprepared to meet and to resist the invasion. Cancer infection is also responsible for the unusual behaviour of some abdominal wounds after operation and is nearly always the cause of unexpected post-operative abdominal fistulae, whether gastric or intestinal, developing after a cancerous growth has been explored or dealt with in some way.

Finally, as conclusive evidence of the reality of cancerous infection of wounds, can one desire anything further than the clinical evidence of the intra-abdominal spread of carcinoma, combined with the post-operative history of cases I have quoted of diffuse infection of the wound, nodular infection following carcinoma of the large intestine and uterus, and needle-hole infection following tapping?

The question of cancerous infection of wounds during operation is a real and exceedingly grave danger and one which I regard of the utmost importance. Moreover, it is a danger that cannot be too carefully guarded against and any failure to avoid it has an important bearing on the question of cancer recurrence.

I am indebted to my colleagues, Mr. F. Bowreman Jessett, for kindly allowing me to quote Case 24; to Dr. A. Paine and Dr. D. J. Morgan for their valuable help in the pathological department; and to Dr. T. Johnston English who kindly prepared the photographs.

Harley-street, W.