A Lecture

ON

CARCINOMA OF THE COLON.

DELIVERED AT THE MEDICAL GRADUATES' COLLEGE
AND POLYCLINIC.By V. ZACHARY COPE, B.A., M.D., M.S.LOND.,
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THE large bowel, in marked contrast to the small intestine, is very prone to malignant change; the irritation caused by the bowel contents, which progress slowly and may be hard in consistency, is probably accountable for this, though some other reason must be sought for the frequent incidence of cancer in the caecal region, where the contents are fluid. In the latter position, however, bacterial action is at its maximum, and this may be of significance as a predisposing factor to cancer.

I am not concerned here with carcinoma of the rectum, but with those cancers affecting the bowel from the caecum or caput coli to the recto-sigmoidal junction, situated opposite the third piece of the sacrum. The subject is important, both on account of the frequency of the condition and because recent advances in diagnostic methods and treatment have greatly improved our chances of dealing radically with the disease. That it is comparatively frequent may be judged from the fact that out of over four thousand general surgical cases admitted to the wards of St. Mary's Hospital during the past two years, twenty were cases of cancer of the colon—a proportion of about one in two hundred.

Some parts of the colon are more frequently attacked than others. Taking the distribution of 100 cases, at least 36 would be situated in the sigmoid (iliac and pelvic) colon, and about 25 in the caecum. The transverse colon and splenic flexure, the hepatic flexure, and the ascending and descending colon are accountable for the rest in about that order of frequency. Certainly the ascending and descending portions are the least often affected. Statistics vary considerably, and can only be obtained approximately. Of 20 cases which I have had cognizance of at St. Mary's during the last two years, 11 occurred in the iliac and pelvic colon, 3 in the splenic flexure, 2 at the hepatic flexure, 2 in the caecum, and 1 each in the descending and transverse portions of the colon.

The microscopic anatomy in practically all cases is that of a columnar-celled carcinoma, which arises from the glands of Lieberkühn. Wide variations exist in the reaction of the connective tissue to the invading cancer cells. In those instances where there is slight resistance to its advance a tumour forms by the extension of the growth both along and round the bowel. This form is prone to degenerative and ulcerative changes. In other cases the cancer is strenuously resisted by the formation of connective tissue, which contracts and strangles the advancing cancerous cells. This progress is comparable to the slow advance of an atrophic scirrhus of the breast, with the important difference that the breast complaint may not cause any marked inconvenience for years, whilst the bowel lesion tends to obstruct the lumen exactly in proportion to the natural attempts at cure. The lymphatics and blood vessels course round the bowel wall in a circular fashion, so that a ring of involved tissue is soon formed. We can, therefore, recognize two main clinical types—the first with tumour formation growing fairly rapidly; the second with no tumour to be felt, but causing a hard, malignant ring, which constricts the bowel. This ring growth is often very narrow, and has sometimes the appearance as if a piece of string had been tightly tied round the bowel. If one recalls the normal sacculations of the large bowel, it will easily be appreciated how it may need a very careful search to discover the puckered ring, even when the hand is inside the abdomen. There is a third and rarer variety of cancer of the colon which deserves a passing mention—that is, the malignant growth taking origin from a simple adenomatous polypus.

The progress of cancer of the colon is usually comparatively slow. It has been stated to be the least malignant of the carcinomata.¹ For a long time the

disease is limited to the bowel, and the lymphatic glands are involved later than is the rule in most other parts of the body. One observer² found that in 40 per cent. of fatal cases the disease was limited to the gut. This would probably prove to be an under-estimation of the frequency of gland involvement if a larger series of cases were taken. The profession owes a debt to Jamieson and Dobson,³ who thoroughly worked out the lymphatic drainage system of the colon, thus paving the way for the performance of scientific radical operations. These observers found that the lymph drained into four groups of glands—the epicolic, situated on the bowel wall; the paracolic, close to the gut on the vascular arches; the intermediate group lying on the arterial branches between the vascular arcades and the main trunk; and the main set grouped round the colic arteries close to their origin. Lymphatics run from the bowel wall direct to the epicolic and paracolic glands, sometimes to the intermediate, and occasionally to the main groups. From the transverse colon and splenic flexure most of the lymphatics are stopped at the paracolic group. Cancer may infect any or all of these gland stages, and even form metastases in the liver, although this is uncommon until late in the case.

The local changes which result vary according to the type of growth. The first type, which grows rather quickly and forms a palpable tumour, is not so apt to cause intestinal obstruction; it is more cellular and softer than the second type, and though it may project into the bowel lumen so as to impede the advance of the contents, yet ulceration commonly minimizes or removes such obstruction. It is also more likely to spread to neighbouring organs and cause infiltration of adjacent viscera, such as bladder, kidney, and pancreas; infection of the ulcerated surface occurs, and the symptoms of colitis result.

The second type, or annular scirrhus, produces a slow but sure narrowing of the lumen of the gut. This leads to hypertrophy immediately above the growth. This compensatory hypertrophy continues *pari passu* with the increasing obstruction until urgent symptoms arise from an attack of acute intestinal obstruction. It is a curious fact that in such an event the caecum is usually the most distended portion of the gut, even though the obstruction be so far on as the sigmoid flexure; this distension may proceed almost to bursting point. At least a partial explanation of this may be afforded by the researches of Cannon⁴ and others, who have shown that antiperistalsis is one of the normal movements of the ascending and transverse portions of the colon. It is possible that an organic obstruction may produce storms of antiperistaltic waves ending at the caecum, which consequently becomes greatly distended.

SYMPTOMS.

The signs and symptoms of cancer of the colon differ along with its pathological characteristics. There is no constant, ordered sequence of symptoms, for any one of a large number may be the first noticed. Constipation, diarrhoea, vomiting, pain, a tumour, increasing distension of the abdomen—one or several of these may herald the condition. A point to be laid stress upon is that the condition may be latent, and an attack of acute or subacute obstruction may be the first serious symptom to which attention is drawn. This is especially true of the scirrhus type. It is quite common to meet with cases which furnish a history of only a few weeks' constipation in which the growth as seen at operation certainly must have been growing for a much longer period. It is therefore all the more necessary to pay attention to slight symptoms of bowel trouble, so that, if possible, we may detect any morbid condition in the earliest stages.

The symptoms may be classified under six headings, but it must be remembered that the combinations of symptoms are varied and only one or two may be present in any particular case.

1. Symptoms due to Bowel Obstruction.

Under this heading come pain, constipation, distension, nausea, vomiting, and visible peristalsis. The pain is due to the contractions of the gut above the narrowed part, and, like all violent contractions of circular involuntary muscle, is cramp-like or colicky in character. Usually it has no direct time relation to the taking of food, but is often increased by taking aperients. In one patient whom

I saw the taking of sweet things increased the pain. Very frequently the site of the maximum pain indicates the position of the growth. Hertz has shown that intestinal pain is chiefly due to distension; if we consider a peristaltic wave passing along the bowel, the pressure inside the lumen would certainly be greatest just above the obstruction, and in the colon, unlike the small intestine, pain is localized fairly accurately. In view of the reversal of peristalsis which may occur in the right half of the colon, one would expect to find cases where obstruction of the distal part of the colon caused pain in the caecal region; I have seen clinical evidence to support this. Sometimes the patient will describe the pain as travelling across the abdomen and increasing in intensity up to the site of maximum pain. The pain during the early stages is commonly mistaken for indigestion, and if accompanied by nausea or sickness is attributed to a "bilious attack." Vomiting is an infrequent occurrence until rather late, for the large bowel is much more tolerant of obstruction than the small intestine.

Gradually increasing constipation is often the first abnormality, and if this supervenes in a person over middle age who has previously been perfectly regular as to the bowels, suspicion should be aroused and a thorough investigation carried out. By constipation is meant the abnormally infrequent or insufficient passing of formed faeces. The consistency must be ascertained, since the so-called spurious diarrhoea due to irritation may cause frequent but ineffective movements of the bowel. Alternating constipation and diarrhoea may thus occur. Occasional attacks of distension and flatulence are common. The distension may be limited to the region of the abdomen where the colicky pains are greatest. It may happen that the gradual increase in size of the abdomen may first cause any alarm. Visible peristalsis may sometimes be watched through the abdominal wall, and local swelling may subside with a gurgling sound due to passage of flatus through the stricture.

All the above symptoms are frequently so slight as to be regarded as trivial, and completely neglected by the patient, so that it is a common event for an attack of acute intestinal obstruction first to compel attention.

2. *Symptoms due to Bowel Ulceration.*

Diarrhoea and the passage of blood and mucus may result from ulceration of the bowel. As a rule, the bleeding is a little-marked feature, but rarely quite profuse haemorrhage may ensue, doubtless due to erosion of a vessel of some size. If the cancer is high up, the blood may be dark and res-mble melaena. No doubt occult blood would frequently be found in the faeces if it were more commonly sought after. Mucus is frequently passed, and is probably due to the irritation of the glands of the mucous membrane caused by the growth and its attendant bacteria, which readily thrive either amidst the obstructed bowel contents or on the ulcerated surface of the cancer. The fact deserves wider recognition that mucous colitis is often merely a symptom of some more serious disorder. The last two cases of mucous colitis which I have seen proved on further investigation to be due to tumour of the kidney and carcinoma of the sigmoid respectively.

It would appear that diarrhoea can result from two causes. We have already mentioned the spurious diarrhoea, or the diarrhoea of constipation; in other cases I believe extensive ulceration at the site of the growth is sufficient to cause it even when no obstruction is present. The fact that diarrhoea may occur should be remembered, for it may lead patients to assert that the bowels are regular. I know of one patient who suffered from diarrhoea for eighteen months before the disease was discovered.

3. *The Presence of a Tumour.*

A tumour is frequently felt. It may attain a considerable size before it is noticed. It is prone to break down into the bowel lumen, consequently obstruction and pain are not so marked. In the early stages the tumour is often mobile, especially when situated in a part which has a long mesentery, as the transverse or pelvic colon; mobility also occurs with tumours of the hepatic flexure, which moves with the right kidney on respiration. Fixation occurs when any pericolicitis supervenes.

4. *Symptoms due to Extension to other Viscera.*

The symptoms due to extension to other viscera vary according to the organ or viscus involved. It may implicate the kidney or bladder, and give rise to symptoms suggestive of stone or other disease liable to attack those viscera. It may infiltrate the stomach wall and cause simulation of gastric disease. Ulceration may cause fistulous connexion between a part of the colon and small intestine, or another part of the colon. It is uncommon to meet with serious extension to other organs.

5. *Symptoms due to Pericolicitis and Peritoneal Infection.*

Pericolicitis, or inflammation of the tissues round the colon, may be consequent on ulceration and extension of a malignant growth. A local abscess may form and mask the primary condition. Sometimes perforation of the bowel suddenly takes place into the general peritoneal cavity, and diffuse and fatal peritonitis ensues.

6. *General Symptoms, Loss of Weight, etc.*

General symptoms are absent at first. The patient often looks robust. Later, as the growth advances, loss of weight occurs, and anaemia and cachexia develop, but a large number of patients come to a fatal ending from obstruction before they have wasted to any noticeable degree.

DIAGNOSIS.

Any patient who complains of the recent onset of symptoms which might be attributed to cancer of the colon needs, and should obtain, a most complete examination. Bowel irregularity supervening after middle age should never be overlooked. After obtaining a careful history of the case, examination should be carried out on the following lines: The abdomen should be inspected to detect unusual fullness, distension, or visible peristalsis; palpated to find any tumour, and percussed in the flanks to see if there is any free fluid. It must be remembered that the transverse colon often sags down to the iliac fossa or pelvis, and that the sigmoid may be on the right side of the middle line. Little help is gained by auscultation, since borborygmi are usually audible without the help of the stethoscope.

A digital rectal examination is imperative. A cancer of the pelvic colon may occasionally be thus felt, for it sometimes prolapses into the lower portion of bowel, which may be ballooned. I recently felt a growth 8 in. from the anus by this means. This prolapse is apt to mislead as to the true distance of the growth from the anus. It is also important to make a bimanual recto-abdominal examination, for some small mobile growths of the pelvic colon can thus be detected.

Since a large number of colon cancers occur in that part which is suitable for endoscopy, there is no reason why the majority of them should not be revealed at an early stage by the use of the sigmoidoscope. Endoscopy of the sigmoid is free from risk if due precautions be taken, and furnishes most valuable information. Sigmoidoscopy can be carried out without an anaesthetic, though in some cases it is better to administer one. The patient (after as thorough a preparation of the bowels as is possible) is put into the Sims's or knee-elbow position, and the warmed lubricated end of the instrument inserted gently just within the anus. The obturator is then taken out, the light inserted, and by the aid of inflation the end of the sigmoidoscope can be safely passed up, the observer watching continuously the opening channel which the instrument has to traverse.

There is another valuable method of diagnosis which has only comparatively recently been adapted for the assistance of the surgeon. I refer to the taking of an *x-ray* photograph of the abdomen after the administration of a bismuth meal. Two ounces of an inert salt of bismuth (carbonate, subnitrate, or oxychloride) are mixed up with a pint of bread and milk and administered to the patient. At the time when the mixture should have reached the colon an *x-ray* photograph is taken showing the bowel filled with the material which is impervious to the rays. Any stricture is beautifully demonstrated, for the bismuth mush becomes massed on the proximal site of the obstruction, and a thin line may indicate its slow progress through the stricture. It has been found experimentally that food takes about four hours to reach the caecum, and from this it takes

about two hours to traverse each of the ascending, transverse, and descending parts of the colon. If it is thought that the obstruction is in the lower sigmoid, then the bismuth emulsion can be administered as an enema given in the knee-elbow position, and possibly through the sigmoidoscope. This method of diagnosis is still in its infancy, but is destined to enable us to diagnose the obstructing form of colonic cancer at an early stage. Similar methods have proved extremely useful in tracing the outline and fixing the position of oesophageal strictures.

In spite of all these methods, there will remain some cases which present indefinite symptoms and in which diagnosis is doubtful. The question of an exploratory abdominal section then arises. If the general condition is good enough, this is a justifiable and necessary procedure, and should be strongly urged upon the patient; but in constitutionally feeble subjects it is not wise to open the abdomen unless the indications are very definite.

The conditions from which cancer of the colon has to be distinguished, and for which it is often mistaken, are numerous. The early symptoms of obstruction, colicky pains, flatulence, and occasional vomiting, are frequently ascribed to dyspepsia. When a more acute attack of obstruction supervenes, several conditions need to be excluded. Some help is afforded by the fact that, excluding strangulated herniae, cancer of the colon is the commonest cause of acute obstruction in persons over middle age. Volvulus is likely to give rise to more acute symptoms, and the distension to come on more rapidly. Intussusception in the adult is rare, and when it does occur is sometimes caused by a malignant growth. Simple stricture of the colon cannot be diagnosed from cancer before operation; indeed, a microscopical investigation is sometimes needed to distinguish. It is well known that symptoms due to obstruction of the large intestine are much less acute than those resulting from a similar obstruction of the small gut. Vomiting is less marked, and comes on later, whilst pain is usually much less acute. This is what one would expect, for the fluid contents of the jejunum and ileum pass along quickly at the rate of 5 ft. an hour, whilst the colon usually retains its more solid contents for many hours, and may do so in some cases even for days or weeks without any serious consequences.

There is sometimes an intermittence in the acute obstructive symptoms caused by cancer. In February last a woman, aged 43, was admitted to St. Mary's as an urgent case with a history of a week's constipation, abdominal pain, and vomiting, which had become faeculent. Prior to this attack she had had no abnormal symptoms. On admission vomiting had ceased, pulse and temperature were normal, there was no distension, and the only complaint was that of a little pain in the left hypochondrium. No tumour could be detected. In view of the short history and the absence of physical signs, I was at first inclined to attribute the condition to gastric derangement. She was given small doses of calomel, and, in order to test the question of obstruction, two consecutive turpentine enemata were administered with a few hours' interval. Only flatus came away, and for twenty-four hours the patient was comfortable; then suddenly she vomited a large quantity of faeculent material and became rapidly distended. When I opened the abdomen I found a narrow annular growth in the splenic flexure. I performed caecostomy, and a fortnight later successfully excised the segment affected. In the same month I operated on a case of sigmoid growth in a man of 68, in whom symptoms remitted, but increased rapidly after the giving of an enema. These cases serve to show how acute symptoms may suddenly become quiescent and deceive the observer. In both cases the giving of an enema appeared to cause an aggravation of the condition. It has been proved by Cannon⁴ that in cats the giving of rectal injections stimulates antiperistalsis in the colon; a similar mechanism may partially explain these cases.

I have referred above to the real danger of mistaking a case of colon cancer for ulcerative or mucous colitis, especially in older people.

Those cases that come under observation with a tumour may be rather puzzling. In the caecal region such a lump can be mistaken for chronic appendicitis or hypertrophic tuberculosis of the caecum. A careful history should distinguish the former, but the latter may be indistinguishable from cancer unless tubercle bacilli are discovered in

the faeces, or one of the tuberculin tests or the opsonic index give positive indication. Absolute diagnosis is not so important, since excision is probably the best treatment for hypertrophic tuberculosis. At the hepatic flexure tumours of the kidney, liver, and gall bladder have to be excluded. I personally know of one case, and have read of another, where cancer of this flexure was mistaken for a mobile kidney. The shape of the tumour is not reniform, however, and careful inquiry usually elicits a history of some bowel irregularity. In the transverse colon and splenic flexure the tumour may be mistaken for gastric carcinoma, but anaemia and loss of weight are more marked in the latter, and the pain has direct relation to the taking of food. Analysis of a test meal is important.

When the cancer invades or becomes adherent to neighbouring viscera it causes symptoms of a misleading nature. All or some of the many methods of diagnosis in vesical or renal diseases can be utilized if symptoms be referred to those organs; if the stomach is invaded it may be very difficult, apart from the history, to say in which part the disease began.

When general peritonitis ensues on the perforation of the gut, diagnosis of the cause may not be made till the abdomen is opened; when localized pericolicitis causes abscess formation on the right side it may easily be mistaken for an appendix abscess.

PROGNOSIS.

The prognosis of cancer of the colon is bad unless the condition is treated by operation. A fatal result follows from acute obstruction, involvement of other viscera, general peritonitis, or progressive anaemia and asthenia. The less malignant the growth, or the more the cancer is resisted locally, the sooner the obstructive symptoms arise, but, at the same time, the better the outlook for operative measures.

TREATMENT.

The treatment of cancer of the colon is surgical save for those cases which have gone too far for excision and which present no obstructive symptoms. We might possibly also except some low sigmoid growths to which it would be possible to apply radium by means of the sigmoidoscope. The manner of treatment varies with the stage of the disease and the state of the patient when brought under observation.

Cases without Acute Symptoms.

In judging which is the best operation to adopt in cases which are suitable for excision and present no acute symptoms, it must be borne in mind that the patients are often old and feeble, and that the cancer tends to destroy life as much by intestinal obstruction as by extension and metastases. In quite a considerable percentage of cases metastases are late in appearing, even in the adjacent glands. When the conditions warrant it, however, one should perform the ideal operation, which consists in the excision of the growth and as much adjacent bowel as may be necessary, together with the lymphatic drainage area of the affected part. Jamieson and Dobson have worked out the principles of such operations for each part of the colon. The main blood vessel supplying the diseased part has in most cases to be ligated, and all the bowel depending upon that artery for its chief blood supply must be removed. In cancer of the caecum the ileo-colic artery is tied just below the duodenum, and the last 6 in. of ileum, the caecum and colon to just beyond the hepatic flexure are removed, together with the peritoneum covering and the lymphatic glands lying along the ileo-colic artery and its branches. For a growth at the hepatic flexure the bowel must be removed from the end of the ileum to the left third of the transverse colon, since the middle colic artery has to be ligated. Cancer of the transverse colon commonly does not affect more than the paracolic glands until very late, for no lymphatics run direct to the intermediate or main groups, so that a resection of the growth with a few inches of gut on each side and the adjacent mesentery is sufficient. A limited excision is also advisable for the splenic flexure, for from this part some lymphatics go to the splenic glands which could not be removed thoroughly. When the descending colon is involved the left colic artery is ligated and the bowel removed from the left third of the transverse colon to the beginning of the iliac colon.

Growths of the pelvic colon are dealt with by ligating the inferior mesenteric artery below the origin of the left colic and excising most of the sigmoid loop with mesentery and contained glands.

Though the colon frequently has no proper mesentery in its ascending and descending parts, and at the hepatic and splenic flexures, yet it can be mobilized sufficiently to bring it out of the abdomen by cutting through the peritoneum as it is reflected from the outer side on to the posterior abdominal wall. Care has to be taken to avoid injury to such important structures as the duodenum, ureter, vena cava, and spermatic vessels.

Though in suitable cases—the number of which should increase considerably as we diagnose the condition earlier—these operations are to be carried out, yet practical experience has shown that good results can be obtained by a more limited operation. Many operators have reported cases in which they excised the local growth, but left enlarged lymphatic glands, and yet the patient kept well for many years. In some of these cases the glands were probably inflammatory; but doubtless there are some cases where the tissues of the individual can overcome the migrating cancer cells. Lockhart Mummery, in thirty cases where he looked for enlarged glands at operation, found the mesocolic glands enlarged in five, and the retroperitoneal in two instances, whilst two cases had metastases in the liver.

With a limited excision the cancerous segment is removed along with a sufficient margin of healthy bowel on each side. Regard must be paid to the blood supply of the bowel which is left, and if this is imperilled more bowel must be removed. The procedure may be performed in one or more stages.

Operation in One Stage.

This is never admissible unless the bowel can be well emptied beforehand. There is not a consensus of opinion as to the best way of dealing with the severed ends of the bowel after the diseased segment has been excised. In theory the ideal method would be to perform end-to-end suture, and this has been done with success. But such a method has several drawbacks when applied to the large intestine; the sacculization of the bowel, the presence of appendices epiploicae, and the absence of a complete peritoneal investment may render it difficult, added to which in some parts the suture line will have to stand the strain and irritation of solid faeces. If there has been marked obstruction, the difference in calibre between the proximal and distal ends may be considerable. End-to-end union is more suitable for those cases in which a colostomy has previously been done for obstruction; this obviates any strain on the suture line.

Another method is to excise the diseased part, close the cut ends, and perform lateral anastomosis between the proximal and distal segments. Mayo⁵ says that such anastomosis should always be isoperistaltic in dealing with the colon. Leakage may occur from the closed ends and cause peritoneal infection; to avoid any risk of this, Bloodgood⁶ has suggested bringing the closed ends out of the abdomen. End-to-end union by means of a Murphy button has been performed occasionally with success, but this would now hardly be considered sound surgery.

In excision of the caecum or right half of the colon the best plan is to cut across the ileum near its termination and implant it laterally into the transverse or pelvic colon.

Operation in more than One Stage.

By operating in two or three stages the mortality has been more than halved. One of the safest and best known methods is that devised by Paul of Liverpool, who practically made the operation an extraperitoneal one. The affected loop of gut is brought outside the abdomen, and the vessels in its mesentery ligated. The mesentery is then cut across, and the proximal and distal portions of the loop sutured together. The portion requiring excision is then cut away and a glass tube inserted into each end to drain away the intestinal contents. Later the spur between the two ends is crushed and the continuity of the gut re-established. The artificial anus left after crushing the spur can be closed by a later plastic operation. The primary operation can be modified by leaving the excision

of the cancerous portion till a few days after bringing the loop of intestine outside the abdomen. The drawback to Paul's operation is that only a limited segment of mesentery with its contained glands can be removed.

A type of two-stage operation which is sometimes carried out is that in which the affected segment is first short-circuited and later excised. The short-circuiting can be done by lateral implantation, or lateral anastomosis. This method provides a cleaner field of operation at the time of excision.

Cases with Obstruction.

When there is acute or subacute obstruction present, that condition must first be treated. A similar method is advisable when the bowel cannot be properly emptied before operation. In a case of acute obstruction the part behind the stricture is filled with bacterial toxins, which not only poison the patient but render impossible any radical operation involving suture of intestine. In such cases the immediate indication is to perform caecostomy or colostomy above the obstruction, and later excise by one of the above-mentioned methods.

In some cases presenting marked obstructive symptoms Paul's operation may be carried out.

In those cases which have progressed too far for excision to be practicable or advisable, surgery does not need to step in unless symptoms of obstruction are threatening or some special complication exists. Obstruction is treated by short-circuiting the strictured part or opening the bowel above it. Occasionally bilateral exclusion may be deemed advisable; in this the bowel is cut across above and below the neoplasm, between it and the site of lateral anastomosis which has been previously performed. One end of the excluded portion is brought to the surface so as to drain away the foul contents, which if retained may lead to distension and leakage into the peritoneal cavity. The other end is either closed or also brought to the surface.

If local peritonitis, abscess formation, or general peritonitis result from carcinoma of the colon such conditions must be treated first, and the growth excised or short-circuited later if the patient recovers from the complication.

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- ³ Jamieson and Dobson, *Annals of Surgery*, vol. 1, p. 1073.
- ⁴ W. B. Cannon, *The Mechanical Factors of Digestion*, chap. xii.
- ⁵ William Mayo, *Annals of Surgery*, vol. 1, p. 200 et seq.
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APPENDICITIS :

THE RESULTS OF OPERATIONS UPON 619 CASES.

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I wish to record here the lessons to be derived from the results in 619 cases of appendicitis submitted to operation. I have divided the cases into several classes, each of which includes a well-marked group.

1. "Interval" Cases.

This includes those cases in which there had been one or more attacks of appendicitis and in which the operations were performed while there was no active inflammation. It does not include any cases in which the appendix was removed in the course of an abdominal section performed for some other condition, merely because it was an appendix. Such removal of the appendix does not appear to me to be either a wise or justifiable procedure. There were 113 cases and no deaths.

2. Acute Cases.

(a) *Early cases*, in which the inflammation was confined to the appendix itself. The appendix was removed in each case, but no drainage of the wound was necessary. There were 63 cases and no deaths.

(b) *Later cases*, in which there was localized peritonitis. In all of these cases the appendix was removed and drainage of the wound was necessary. There were 93 cases and 2 deaths.