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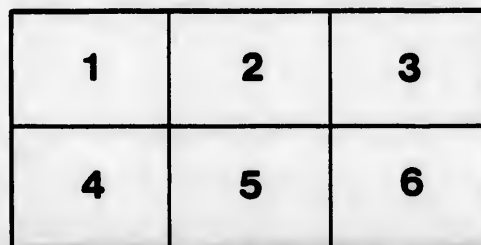
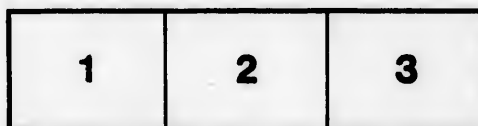
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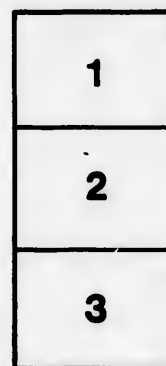
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EXCISION
OF
PORTIONS OF THE INTESTINE.

BY
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MEDICAL SUPERINTENDENT OF THE MONTREAL GENERAL HOSPITAL.

(Read before the Canada Medical Association, at Kingston, September, 1888.)

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EXCISION OF PORTIONS OF THE INTESTINE.

By JAMES BELL, M.D.,

Medical Superintendent of the Montreal General Hospital.

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The groundwork of my paper consists of the reports of 14 cases of experimental resections of the intestine in dogs. I was led to make this series of experiments by the observation during the past few years of a number of cases of intussusception, hernial and other strangulations, stricture, ulcer, and the various neoplasms which affect the intestinal canal, which were either subjected to equally severe, but less satisfactory, treatment, or abandoned to die as beyond the reach of surgical aid. When I say "equally severe, but less satisfactory, treatment," I refer, of course, to the orthodox treatment of intussusception by inflation or even by abdominal section, and endeavoring to replace the inverted bowel; and the production of an artificial anus in hernia when the bowel had sloughed. Emboldened by the recent successes in the various branches of abdominal surgery, I reasoned that, under ordinary circumstances, almost any portion of the intestinal tract—certainly any portion of the small intestine—should be removable with the greatest ease, and if the ends could be kept in close apposition for a sufficient length of time, union should occur. I therefore proceeded to operate upon a number of dogs—although I was warned by veterinary surgeons that the dog was considered by them to be specially susceptible to peritonitis—and I consider the results most satisfactory. The follow-

ing are brief notes of the cases. I have divided them into two series of seven cases each—the difference being that in the first series catgut sutures only were used to unite the ends of the bowel, and in the second series silk sutures only were used. The operations were all done under carbolic spray :—

First Series.

CASE I.—A young mongrel terrier bitch, dirty, ill-nourished, and suffering from distemper, was operated on on the 24th of March last. An incision about three inches long was made in the median line of the abdomen. The omentum was drawn up out of the way with the finger, and a coil of the small intestine withdrawn through the wound. The several branches of the mesenteric artery leading to this portion of the bowel were ligatured by passing catgut ligatures around each with an aneurism needle. The portion of gut thus isolated, $3\frac{1}{2}$ inches long, was then cut off with the scissors, an assistant holding the ends beyond, between the finger and thumb of each hand, to prevent the escape of contents. I then tried to pare away the peritoneal surface of the upper portion of the bowel, intending to push it into the lower portion after having pared away the mucous surface of it to correspond, but I found this quite impossible, as the end of the bowel contracted slightly as soon as it was cut, and the mucous membrane became everted to the extent of nearly a quarter of an inch. I then united the ends by a continuous "over and over" suture of fine catgut, cleansed the bowel thoroughly, and returned it to the abdominal cavity. I closed the abdominal wound with three silver and several catgut sutures, and covered the wound with iodoform, packing it well into the spaces between the sutures. This and all the subsequent operations were done under ether, and as the details of the operation are essentially the same in all, except in the suturing of the ends of the bowel, it will be unnecessary to repeat them. This dog was given a hypodermic injection of ten minims of Liq. Opii Sed., and this was the only medicinal treatment given. None of the others had any medicinal treatment whatever. It spent the day quietly, and took milk greedily in the evening. Its pulse was rapid, and its temperature a little high throughout. The tem-

perature was carefully taken in all the first series of cases, and shows very little elevation—the normal temperature of the dog being about 102°F., and easily disturbed. A liquid stool occurred at the end of 48 hours, and the further progress of the case was uninterrupted. The “distemper” (as shown chiefly by purulent discharge from the nose) continued, and the animal grew thinner and weaker, and died on the 11th of April, 18 days after operation. At the autopsy, 90 hours after death, the abdominal wound was found to be perfectly united and all the organs healthy. There were a few adhesions of omentum and of one coil of small intestine at the site of operation. The union of the bowel was perfect, but had produced considerable narrowing. This I attribute to the puckering produced by the continuous suture. The specimen is labelled “I.”* The death in this case, I believe, was due to the “distemper,” as there was no other evident cause.

CASE II.—This dog was a healthy, well-nourished young mongrel, with some resemblance to the otter-hound species. When brought up for operation on the 28th of March, I found him gorged with meat. My rule in all the cases was to keep the dog on low diet for about two days before operation, and on a moderate milk diet afterwards. This dog had been fed about an hour before the operation by an over-zealous and too humane servant. I proceeded with the operation, however, and removed three inches of the small intestine in the same manner as in the last case. The ends of the gut were brought together by a double row of catgut sutures. The first row consisted of as many interrupted sutures as could conveniently be inserted, and the second row of a continuous “over and over” suture, catching the spaces between the former. The bowel was returned, and the abdomen closed and dressed as in the other case. Copious vomiting of undigested food occurred half an hour after the operation, and a solid stool was passed about 60 hours afterwards. The abdominal sutures were removed on the ninth day, and the dog continued in perfect health. On the 29th of June, I ligated his right carotid artery with catgut. He recovered, without a bad symptom; and on the 26th of July, just 4 months

* Portions of bowel, showing the results of operation in each case, were exhibited in connection with the paper.

(less three days) after resection of the bowel, I killed him by pithing. The body was well nourished—in fact, quite fat—and there were no adhesions in the peritoneal cavity. The organs were all healthy and the bowel perfectly united.

CASE III.—A healthy, well-nourished mongrel bitch; 12½ inches of intestine were removed in the usual way on the 30th of March, and the ends of the bowel united as in Case II. A similar stool was passed on the third day. There was slight elevation of temperature for two or three days, but otherwise the dog was perfectly well after the first 24 hours. She took milk greedily, was playful and active, and never had a bad symptom throughout. On the 20th of April, I gave her ether and cut one of her costal cartilages subcutaneously to observe the process of repair in it. On the 29th of May, two months after the first operation, I gave her ether and bled her to death by cutting the femoral artery across. At the autopsy, the body was found to be well-nourished, all the organs healthy, no adhesions in the peritoneal cavity, and the union of the bowel perfect. There was no union of the costal cartilage.

CASE IV.—A bright, active, young fox terrier; six inches of small intestine were removed on the 3rd of April. The ends of the bowel were united with twelve interrupted and a continuous catgut suture. The abdominal sutures were removed on the fifth day, when he was apparently perfectly well in every respect. He continued well, and grew fat, until the 22nd, when he had a chill, and became feverish. Symptoms of "distemper" came on, and he grew gradually weaker from day to day, and died on the 18th of May, 45 days after the operation. There was slight prolapse of the omentum after removing the abdominal sutures, but it required no treatment. At the autopsy, all the organs were found to be healthy, and the union of the bowel complete and without adhesions.

It will be observed that in this specimen there is at one place a deficiency, or rather an absence, of mucous membrane. This is due to the fact that in this case I tried to include in my sutures only the peritoneal and muscular coats when uniting the ends of the gut. I found it so difficult, however, that after doing a small

portion of the circumference in this way, I desisted, and did as in all the other cases, catching the whole thickness of the bowel, mucous membrane and all, in my sutures. The deficiency in the mucous membrane corresponds (in extent at least) to the portion of bowel sutured in this way.

CASE V.—A young, active, and well-nourished mongrel hound was operated on on the 3rd of April. Nine inches of bowel were removed, and the ends united by 32 interrupted catgut sutures. He did well, and on the 7th of April, four days after operation, I removed the abdominal sutures. A liquid stool occurred during the operation. In this and the last case I was unable to determine when the first stools were passed after operation, as I had a number of dogs on hand, and was obliged to keep these two in a room with two others. On the next day I found the abdominal wound open and a large omental protrusion. On the following day I gave him ether, re-opened the wound completely, and returned the omental hernia. He never was right after this operation, and sank gradually, dying on the 14th, eleven days after the resection, and four days after the operation for the return of the omentum. At the autopsy, there was gaping of the ends of the bowel, escape of contents, and general peritonitis. The bowel was partially united. The abdominal sutures were removed too early (on the fourth day), and I attribute the death of this animal to the violence employed in giving ether a second time and returning the omentum. This, I think, probably partially separated the recently united bowel, allowing escape of faecal matter into the peritoneal cavity.

CASE VI.—A toy Scotch terrier pup, weighing $3\frac{1}{2}$ lbs., was operated on on the 5th of April. Five inches of bowel were removed, and the ends united by interrupted catgut sutures. Very fine gut was used, as the bowel was very small. The dog did quite well for 48 hours, but was found dead a few hours later. At the autopsy, the ends of the bowel were found lying about three-quarters of an inch apart, the catgut having given way everywhere, and the intestinal contents in the peritoneal

cavity, which was intensely engorged throughout. The result of this case determined me to use silk sutures, though I did one more case with catgut.

CASE VII.—A mongrel black and tan, aged. Ten inches of gut were removed on the 8th of April, and the ends united by a double continuous suture. The first round was the ordinary post-mortem-room suture—every stitch inserted from within outwards. I did not like the appearance of this when done, and I put in a second round of “over and over” suture of catgut also. The bowels moved on the second day, and the dog made an uninterrupted recovery. On the 29th, I cut one of his costal cartilages subcutaneously, which produced no bad symptoms. On the 3rd of June, 56 days after the operation, I killed him by blowing air into the jugular vein. At the autopsy, the organs were all healthy. There was no trace of peritonitis, and the bowel was perfectly united.

Second Series.

CASE I.—An aged black terrier. Eight inches of bowel were removed on the 20th of April, and the ends sutured by twenty interrupted sutures of fine carbolized spun silk. The bowels were moved the same night, a solid stool passing, and the dog made an uninterrupted recovery. On the 10th of June, 51 days after operation, I killed him with prussic acid. All the organs were healthy, and the body well-nourished and fat. There was slight adhesion of two coils of intestine at the point of resection, and the bowel was united perfectly.

CASE II.—A young mongrel terrier. Five inches of bowel were removed, and the ends united by fine silk sutures. The dog never rallied, and died 68 hours after the operation. At the autopsy, all the organs were found to be healthy. There was general peritonitis, the peritoneal cavity containing about 3 ounces of grumous fæcal matter. The ends of the bowel were found to be in perfect apposition and the silk sutures holding firmly, but at a point near the mesenteric attachment a segment of the gut had been overlooked and no suture applied, hence the escape of its contents and the bad symptoms from the

first. The sutures have been lost through slitting up the bowel—in fact, the deficiency was not noticed until the bowel had been opened up.

CASE III.—A young mongrel terrier. Seven inches of bowel were removed, and the ends united by 28 interrupted sutures, 15 of silk and 13 of catgut (my supply of silk having given out). Just after the abdominal wound had been closed, a violent fit of vomiting came on, and the abdomen was filled with air, which could be heard escaping through the wound in the bowel. The dog did badly from the first, and died at the end of the fourth day—about 101 hours after the operation—from peritonitis. At the autopsy, all the organs were found to be healthy, and the sutures in position, though slackened, and the ends of the bowel somewhat separated. This specimen was not preserved.

CASE IV.—A toy terrier bitch, weighing about 3lbs., decrepit with old age, and blind from double senile cataract. Ten inches of bowel were removed and the ends united by 21 interrupted sutures on the 3rd of June. The bowels were moved on the second day, and there never was a bad symptom. She died on the 4th of August, 62 days after operation. She showed no signs of disease, and died, I believe, of senility. The bowel was found to be perfectly united, and there were no traces of peritonitis. This specimen was, unfortunately, neglected for a couple of days, and was destroyed by the great heat then prevailing (August 4th.)

CASE V.—A small and young smooth terrier. Ten inches of bowel, including the cæcum, were removed in the ordinary way and the ends united by 20 interrupted sutures of fine spun silk on the 24th of June. On the 27th, a solid stool was passed. There never was a bad symptom throughout. The abdominal sutures were removed on the 14th day, and the dog was killed by pithing on the 25th of July, 32 days after operation. At the autopsy, the organs were all found to be healthy, and the body well-nourished. There were a few adhesions around the wound in the bowel, but the union was perfect. This specimen shows the attachment of the small to the large gut.

CASE VI.—A young mongrel black-and-tan bitch. Four and a half inches of small intestine were removed and the ends united by 22 interrupted and a continuous suture of fine spun silk on the 1st of July. On the 3rd, a semi-solid stool was passed; and on the 8th, the abdominal sutures were removed. The dog was lively and well throughout. On the 25th, twenty-four days after operation, I killed him by pithing. All the organs were healthy, and the body well-nourished. There were some adhesions between the bowel and the abdominal wall, but the union was perfect. I may note here that although only twenty-eight days had elapsed from the operation, not a trace of the silk sutures could be discovered at the autopsy, and you will observe that the union of the bowel is as complete as in those which survived the operation for months.

CASE VII.—An aged mongrel terrier; 13 inches of duodenum, close to the stomach, were removed on the 8th of July, and the ends united by interrupted sutures of fine spun silk. He did not seem to suffer any inconvenience from the operation, and was well and lively, and took his milk greedily. At the end of the third day I left the city for a few days, and on my return, was disgusted to find that he had escaped. I never saw nor heard of him afterwards, but I have reason to believe that a tender-hearted domestic set him at liberty on the day after I left, not knowing that he had been operated upon.

Now, to summarize the results of these operations,—of the 14 dogs operated upon, 4 died from the effects of operation, but all from preventable causes. The first from the giving way of the catgut sutures too early; the second from meddlesome surgery; the third from careless surgery, and the fourth from an accident which could not have been foreseen. Of the remaining 10, one died of senility 62 days after operation, and two died of “distemper”—one on the 18th and one on the 45th day after operation. Six made perfect and complete recoveries, and did not suffer in nutrition or digestion, nor in any other way, and were killed at periods varying from one to three months after operation. Of the fourteenth we have no record. In the first case only, was there any constriction of the bowel, and in no case

was there the sign of any considerable peritonitis. In fact, in three cases there was absolutely not an adhesion in the peritoneal cavity, and the autopsy might have been made in good faith without discovering that the bowels had ever been interfered with.

I have never seen the operation done on the human subject, but I would submit here the following reports of three cases which have come under my own observation during the past year and a half, and which were, I think, suitable cases for this operation. I could mention other cases as well, but prefer to give only these three as examples of some of the different conditions in which I believe the operation to be indicated. Moreover, in the first two cases, I am able to give the report of the post-mortem examination in corroboration of the diagnosis made at the bedside:—

CASE I.—M. W. was admitted to hospital on the 25th April, 1882, with a small and freely movable tumor below and to the right of the umbilicus. She complained of "constipation," and stated that the first difficulty experienced was eight weeks before admission, and after taking a dose of castor oil. This failed to move her bowels satisfactorily, and caused severe pain and troublesome vomiting for two days. She then felt a tumor for the first time. She had suffered ever since from digestive disturbances of various kinds, and had attacks similar to the one described whenever a purgative was taken. After several days' observation, during which there was no pain nor elevation of temperature, nor other sign of constitutional disturbance, a diagnosis of faecal accumulation was made, and the patient ordered a black draught. This was followed by the most serious and alarming symptoms—pain, vomiting, distension of the bowel above the tumor, and a condition bordering on collapse. There was also complete inability to evacuate the bowels. This condition lasted two or three days, until she had had several small liquid stools, and then the symptoms passed off. Very little change occurred for two or three weeks, when inflammation took place around the tumor, and a circumscribed abscess formed and pointed in the abdominal wall. A minute exploratory opening

was made into this abscess, and some pus and faecal matter escaped. A week later, June 9th, she died of exhaustion. At the autopsy was found a circular ulcer about three-quarters of an inch in width, and extending around the greater part of the circumference of the inner surface of the bowel, and almost completely occluding it. The portion of bowel involved was the hepatic flexure of the colon, and a small perforation had occurred just above the stricture, and produced the localized inflammation which ended in abscess.

CASE II.—The following case was reported at the Medico-Chirurgical Society of Montreal by Dr. F. W. Campbell at our last April meeting. The report is copied from the CANADA MEDICAL AND SURGICAL JOURNAL:

A. B., a stout woman, aged 64, had had an irreducible umbilical hernia for 15 years. She had a painful attack in the hernia four years ago, which subsided in a few days. She was seen by Dr. Campbell, on the 9th of April last, for great pain in the sac. The pad had slipped off, and without waiting to replace it, she jumped out of bed and was immediately seized with great pain. The hernia had been increasing in size lately, and the pad had become too small. The hernia was easily reduced to its ordinary size, and Liq. Opii Sed. given. An enema brought away a quantity of scybalous matter. In the afternoon vomiting set in. On the 10th and 11th she was easier, but vomiting was excessive. An injection brought away a large faecal stool. She had a restless night on the 12th, and more pain, and was seen by Drs. Howard and Fenwick, with Dr. Campbell, with a view to operating, if considered advisable. It was decided not to operate, and during the 13th and 14th she improved a little, but died suddenly on the morning of the 15th. The autopsy showed a thin-walled umbilical sac, not inflamed. In it were two coils of intestine—one, about 13 inches in length, was dark-colored, deeply congested, and inflamed; the other, 9 or 10 inches long, was natural-looking, though a little swollen. There was no adhesion of the bowel to the sac. The inflamed portion of bowel presented two flat bands of slightly thickened peritoneal tissue, where it had probably been for years in contact with the

ring. The inflammation had extended along the adjacent coils in the abdomen for a few inches. When slit across, the mucosa was intensely inflamed, of a deep, livid red color, and covered with closely adherent flakes of croupous exudation. The heart was fatty. There were no other changes of note.

CASE III.—In October, 1882, a strong, healthy, and well-developed French-Canadian, aged 22, came to hospital to see what could be done for an inguinal hernia, which had become strangulated, and had undergone spontaneous cure by sloughing through the skin of the groin. He had been working in a lumber shanty in Michigan in the previous winter, and while lifting produced a right inguinal hernia. Symptoms of strangulation supervened immediately, and as he was quite out of the reach of medical aid, he laid up in his shanty. An "abscess" formed and burst of itself, and he has since discharged all his fæces through this opening in the groin. He consulted a doctor as soon as he was able, but there was then nothing to be done except to devise a truss to retain the bowel and collect the fæces. When I saw him I had considerable difficulty in getting him to remove the pad, for he assured me that I had no idea of the mess it would make. And I certainly had not. When he removed the pad, the everted bowel rolled out in spite of him for, at least, many inches, and poured out a quantity of thin, semi-feculant matter, and he was obliged to lie down upon his back to get it returned, and even then he had difficulty. I advised him then that nothing could be done for him. I would now, I believe, with the light of subsequent experience, lay the matter fully before him, and advise that the opened portion of bowel (which was, I have no doubt, small intestine) be excised, the ends united and returned to the abdomen, and the artificial anus in the groin closed. Now, although the operation can scarcely be said to be a recognized one, especially in this country, the journals of late years record numerous cases, chiefly in Germany, but also in England and in America, in which it has been performed with very great success. For example, Prof. Czerny, in the *Berliner Klinische Wochenschrift* (45, 1880), reports three cases of intestinal resection,—in two cases, the removal

of coils of gangrenous bowel in strangulated hernia; and in the third, the removal of a malignant tumor of the colon. In one of the first mentioned cases, there was perfect recovery without fever or reaction of any sort. The second patient, who was pulseless at the time of operating, died soon after in a fit of faecal vomiting. In the third case, the transverse colon and sigmoid flexure, which were bound together by cancerous infiltration, were resected, and the patient recovered perfectly, and was alive and well six months afterwards. He united the ends of the bowel by carbolized sutures half-an-inch apart, including the whole thickness of the gut, and a second row, one-fifth of an inch apart, including only the serous and muscular coats.

Dr. Koeberle, of Strasburg, in the *Gazette Hebdomadaire*, reports a case of chronic and gradually developing intestinal obstruction. On performing abdominal section, he found four strictures involving six feet and a half of the small intestine, the whole of which he removed with perfect success.

Dr. Wm. Fuller, of Grand Rapids, Michigan, and formerly of Montreal, reports in the *New York Medical Record* for October 14th, 1882, three cases of intestinal resection. In the first case, he removed $5\frac{1}{2}$ inches of sloughing bowel from a strangulated hernia, and the patient recovered perfectly. In the second case, also one of hernia, he excised a portion of omentum with sloughing bowel, and the patient recovered. In the third case, he removed 4 inches of bowel from a child 15 months old for irreducible intussusception, and with perfect success. He united the ends of the bowel with carbolized and waxed linen thread, leaving the ends hanging out of the wound and employing drainage.

In the *Edinburgh Medical Journal* for May, 1882, is a selection from the *Centralblatt für Chirurgie* by Kramer, in which he quotes Jaffe as giving a description of the operation from 16 cases, of which 9 died. He recommends rigid antiseptic precautions, prefers catgut to silk sutures, and recommends placing as many sutures as possible within the gut, preferring Gussenbaum's safety stitch, or, better still, Lembert and Czerny's double row suture. He also pares away the mucous membrane rather

than include it in the suture. From the great care taken by the German surgeons to avoid including the mucous membrane in their sutures, I infer that they hold it to be necessary to approximate freshly pared surfaces at all points. On theoretical grounds, this is precisely the conclusion which one must arrive at, but in the specimens before you, in which no such precautions were taken, the most perfect union has resulted. The only explanation which I can offer for this fact is the following: When each suture is drawn tight, and tied, it cuts through the more yielding mucous membrane, or displaces it, and actually does bring the more resisting muscular and serous coats into more or less accurate apposition. Now when sutures are inserted a 20th or a 30th of an inch apart, or even at less distances, the areas in which the mucous membranes remain in contact are really very narrow, and as the bowel is copiously supplied with blood, and is in all respects so situated as to be in the most favorable condition for healing rapidly, the inflammatory reaction and, probably, plastic exudation which occurs within the first few hours after the operation soon obliterates the mucous membrane at these points, and union occurs by cicatricial tissue just in the same way as between two inflamed pleural or pericardial surfaces.

The foregoing, with other isolated cases reported, to say nothing of the very many well-authenticated cases of sloughing of the bowel from obstruction, and its subsequent passage per rectum often in portions several feet long, show that the tendency to recovery after the loss of intestine is very great. No surgeon hesitates to open the abdominal cavity in these days, and of all abdominal operations, I believe resection of the intestine to be the simplest and easiest, and that it involves less peritoneal irritation than most others, while, under ordinary circumstances, there is no danger whatever of leaving blood or foreign matter in the peritoneal cavity. Gastrotomy is now an established operation, but is necessarily nearly always performed for malignant disease, so that, apart from the greater difficulties in the operation itself, the results are at best only palliative, and the ultimate prognosis most serious.

At the German Medical Congress in 1882, Prof. Billroth stated

as the result of his experience, that only one case in 60 was suitable for operation. Ovariectomy, Oophorectomy, and the various operations upon the uterus and its appendages, are always attended with considerable injury to the peritoneum, and much danger of escape into the cavity of irritating fluids and of blood, and yet they are surprisingly successful, and, now-a-days, always undertaken without hesitation. Abdominal section is now frequently performed as a *dernier resort* in cases of obstruction of the bowel from invagination, although, I believe, comparatively few surgeons have yet gone the length of excising the obstructed portion when it has been found impossible to reduce it, or where sloughing has occurred. Even when the invagination has been successfully reduced, difficulty is often experienced in returning the distended intestines to the abdominal cavity, and the common practice seems to be to puncture the bowel in several places to allow of the escape of gas. I would suggest that it would probably be safer to make a free cut across the front of the bowel, outside the abdomen, allow the gas to escape, and stitch it up carefully and return it. I believe it would be safer for two reasons. First, because such a wound could be more perfectly closed than several punctures; and, secondly, the gas would all escape at once and outside of the abdomen, whereas, when punctured, it would only escape gradually, and probably continue to escape after the gut had been returned to the abdomen. In hernia, where the bowel has sloughed, I believe resection would not only give an incomparably better result if successful, but would be a safer operation. In conclusion, therefore, I would submit the following propositions:—

1. That the intestinal canal, from the pylorus to the rectum, is subject to many local diseases which are not amenable to medicinal treatment. As examples, I might mention ulcer, stricture, impaction of contents, obliteration or sloughing from strangulation or inflammatory action, and the different neoplasms which affect the intestinal walls.
2. That the diagnosis and the approximate location of such lesions is usually easy and satisfactory.
3. That resection of any portion of this tract, especially of

the small intestine, is a simple and easy operation, and from what little experience we already have of it in the human subject, a safe and satisfactory one.

4. That in the operation itself, catgut is not to be relied upon as a suture ; that silk sutures are readily absorbed in the peritoneal cavity, or, at least, that they disappear rapidly without producing any irritation ; that several of the sutures, if not all, should be interrupted, to prevent puckering and narrowing at the point of union ; and that perfect union occurs when the whole thickness of the bowel is included in the sutures. It is therefore unnecessary and unadvisable to pare away the everted mucous membrane.

5. That removal of intestine, even in considerable portions, does not seem to affect digestion or nutrition.

