by the colon, stomach, and thickened neighbouring tissues below; its posterior part was the opening communicating with the left lung. The spleen was contained in the centre of this abscess cavity. On opening the chest some clear serum and lymph were found in the left pleural cavity, and several pleuritic adhesions were apparent. On distending the stomach no fluid escaped. The wound in the viscus had quite healed, but four of the silk sutures were *in situ*; the others had disappeared. On the mucous surface a small depression showed where the ulcer had existed. There was no ulcer on the posterior surface.

CASE III.—My third case I saw late at night in consultation with Dr. Fisher, of Shell Road. The patient, a clerk, with a dyspeptic history, was dining in a café when he was seized with excruciating pain, and fell on the floor writhing in agony. He vomited soon after the onset. A medical man saw him, prescribed morphine, and sent him home, where he remained for some hours until Dr. Fisher was called. He stated that his stomach had troubled him for two years, chiefly by way of pain of a burning kind. On one occasion there had been hæmatemesis. Pressure over the stomach always gave him discomfort. Pain generally came on before food, and was usually eased when food was taken. Five or six weeks ago the pain was more constant and more severe, and was localized to the epigastric region. He was fragile, emaciated, and anaemic.

I saw him twelve hours after the onset, and found him lying in bed, having several times vomited. His face was drawn, his pulse 110 and very compressible. There was only a suggestion of distension. The liver dullness was notably diminished, and slight rigidity of the abdomen, absence of abdominal respiration, and marked shock. The history and symptoms pointed to perforation, and two hours later (or fourteen after the onset) we operated upon him in the hospital.

The anterior aspect of the stomach was explored, when an opening was found about 3 in. from the pylorus near the lesser curvature. Some undigested matter had escaped into the abdomen, and some was noticed issuing from the orifice. Around the opening, which was with difficulty brought to the surface, a considerable lymph exudate was noted, which was carefully removed before dealing with the ulcer. The edges of the ulcer were freshened, inverted, and occluded by a double row of Lembert sutures, and some omentum was stitched over the omentum line. Care was taken not to douche the abdomen, and the stomach exudate was merely mopped up by dry aseptic dabs.

The operation, which lasted half an hour, left the patient very collapsed, and we had recourse to hot cloths and strychnine. The patient made an uneventful but slow recovery, now and again vomiting, and once riding himself of a lemon pip.

The treatment consisted of saline cloths to relieve thirst, alcoholic nutrient enemata, morphine under the skin, and every four hours a teaspoonful of iced water. Feeding by the stomach was very cautiously begun on the fourth day. The patient at this date, eighteen months after the operation, is very fit, having become stout and strong, with barely any dyspeptic trouble.

CASE IV.—My last case, a woman of 30 had been an inmate of the hospital under the care of my colleague, Dr. William Williams. She had been treated for gastric ulcer, and had so far improved that she was allowed to go out. Some weeks later she experienced a sudden pain in the abdomen, accompanied by a faintness and retching but no vomiting. In seven or eight hours she reached the hospital, and an hour later she was on the operating table. Her abdomen was tense and rigid, her liver dullness increased, her breathing thoracic, and she was suffering from slight collapse. On examining the stomach a clean punched-out opening was noted on the anterior aspect from which issued a thick milky fluid. The opening was grasped by two forceps and drawn up into the wound; this prevented the escape of fluid. A purse-string suture was introduced around the opening nearly $\frac{1}{2}$ in. from the edges, and with the two forceps to the outside of the suture ring the stomach was held, while the forceps holding the edges of the wound were depressed and the edges inverted. The circular suture was now made tense, and the operation completed by a row of continuous Lembert sutures. No water was introduced into the abdominal cavity, which was hurriedly cleansed by aseptic dry dabs. The patient made an uninterrupted recovery with the exception of a non-suppurative parotiditis, and is now, eight months after operation, working, fat and well.

REMARKS.

The first case was as simple as the second was complex. A freely movable ulcer, localized extravasation, and immediate operation were enough to ensure success. My second case was under chloroform for fifty minutes in consequence of adhesions which had to be separated and the involvement of the cardiac end, the fixation of which rendered suturing a matter of considerable difficulty. Both my last cases are very encouraging, the third inasmuch as operation was not performed for fourteen hours after rupture. Although leakage had occurred in the last case the stomach contents did not appear to be of a very irritating kind.

It is of interest to note that over 95 per cent. of cases unoperated upon die, while life is rarely prolonged over thirty hours. While ulcers are more frequent on the posterior surface of the stomach perforations are much more frequently met with on the anterior aspect by the operating surgeon. This is probably due to the greater facility with which buttressing adhesions form behind. Jacobson states that out of 90 cases operated upon the perforation in 86 was on the anterior surface.

What is the cause of a subphrenic abscess not obviously connected with the wound area? With an ulcer on the posterior aspect it is easily explained, but it is noteworthy that many cases occur where with an anterior perforation abscess

at the back of the stomach is found. This may be accounted for in one of two ways: (a) By direct trickling of septic material through the foramen of Winslow, or (b) by lymphatic absorption. In an ulcer on the anterior surface the gastric contents have but to travel round the right free border of the lesser omentum and both the peritoneal cavities are soiled, and if the foramen of Winslow be closed by adhesions the invasion of an abscess in the lesser cavity will be obstructed. With regard to operative technique, I think it is well in all cases to scrape the surfaces and edges of the ulcer, and when practicable to use a purse-string suture as a preliminary measure. This can be done in a few seconds, and all extravasation stopped while the final occlusion is completed. I am also convinced that the use of dry dabs should supersede irrigation which serves to dilute, disseminate, and make more soluble the toxic contents. As Turner has suggested, one can easily infect the lesser peritoneal cavity by irrigation of the greater.

Mr. Tobin of Dublin raises a very interesting question when he pleads that no case of perforated gastric ulcer should be removed from where the lesion has occurred. To any one who has noted the effect of movement on the escape of the stomach contents the plea has much to recommend it, and if the diagnosis be correct the simplest appliances only are needed. Boiled towels, cocaine, a few forceps, domestic needles and thread, are all the real requirements in the average case. Many a life has been lost in transit from home to hospital.

OPERATIONS FOR GASTRIC ULCER, ACUTE AND CHRONIC.*

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THE title of this communication, adopted for the sake of brevity, is perhaps wanting in clearness. What I really mean is "operations in the acute emergency of perforation, and for chronic gastric ulcer, under other circumstances." The cases concerned are usually affected with chronic gastric ulcer, and the occurrence of acute perforation imports into them an element of hazard and danger that demands the greatest promptitude, both of recognition and action. It is not my intention to go into detail as to the symptoms of "acute perforation," because Mr. Robert Jones does so in his paper in this issue, and I dare say my cases of the kind are very much like his, both in nature and result, and it will amply suffice for my purpose to merely enumerate them.

TABLE I.—*Chronic Ulceration with Sudden Perforation.*

No.	Date.	Name and Sex.	Operation.	Remarks.
1	Sept. 11th, 1899	E. F. (F.), 31	3 days after perforation	Died 13½ hours after operation.
2	Jan. 19th, 1900	M. D. (F.), 24	5 hours after perforation	Alive and well, June 6th, 1902.
3	Nov. 27th, 1900	A. S. (F.), 23	2 hours after perforation	Alive and well, June 16th, 1902.
4	June 10th, 1901	R. M. (M), 45	14 hours after perforation	Alive and well, Nov., 1902.
5	Jan. 3rd, 1902	A. L. (F.), 28	3 hours after perforation	Alive and well, Nov. 1902.

1. My first case, in a woman aged 31, September 11th, 1899, was only recognized three days after the accident, and consequently the operation was done too late. Even here all the visible and accessible extravasation into the peritoneum was successfully dealt with. The patient died thirteen and a-half hours after operation.

2. My second case, in a woman aged 24, January 19th, 1900, was operated on five hours after the accident, and recovered in a fortnight without difficulty or drawback. I met her about June 6th, 1902, looking better than I had seen her. The emergency was recognized by my colleague, Mr. M. Thelwall Thomas, who was called to her at the time, and sent her

* Read at the annual meeting of the Lancashire and Cheshire Branch of the British Medical Association at Birkenhead.

into hospital. The case was briefly referred to in the BRITISH MEDICAL JOURNAL for March 3rd, 1900, p. 515.

3. My third, in a woman aged 23, operated on November 27th, 1900, within two hours of the accident, was recognized at once by Dr. John McCormick of Liverpool. She also healed quickly and without complication, is now well and hearty, and I saw her in excellent health on June 16th, 1902.

4. My fourth was a man aged 45, waiting in my ward for exploration of the stomach, after several years of dyspeptic symptoms. The acute perforation occurred in hospital on June 10th, 1901, but the operation was not performed till fourteen hours later the same day. The result was just as promptly and quickly successful as in the rest. He is now at sea, but a relative wrote on June 15th, 1902, to the effect that a letter had been received lately from him, saying that he was better than he had been for years. (Seen again November, 1902).

5. My fifth, in a young woman aged 28, was sent in by Dr. Henry Gorst of Huyton, near Liverpool, who recognized the emergency within an hour of its occurrence. I operated about three hours after the accident on January 3rd, 1902, and she also recovered quickly, and on June 17th, 1902, was seen by me in good health. (Seen again with sound scar, November, 1902).

Cases of chronic gastric ulcer are apt to be attended with alteration in the shape of the stomach, sometimes of quite a deforming kind. For instance, in Case II of the short series just mentioned, the stomach had an hour-glass contraction about its middle, and the acute perforation had taken place on the front side of the narrowing. In addition to paring the edges of the perforation, I freely incised the narrowed portion in the horizontal direction along the front, widely separating the edges just made, and approximating the right and left end of the incision, thus performing a plastic operation of the simplest and most elementary kind; the same device, in fact, that is used in pyloroplasty, in widening the preputial orifice by incision, and that serves admirably at times also in the case of contracted burn scars in the neck and elsewhere. In Case IV of the same series, a man who had suffered five years from dyspepsia, and in whom I intended to perform exploration with a view to further procedure, the pylorus was found to have been effaced altogether, and outside the stomach in this deformed region were cicatrices indicating at once the severity of the former inflammatory change, and the amount of reparation effected by Nature. The front of this deformed region was the seat of perforation through contracted and hardened tissues. The alimentary tube was here incised, freed from abnormal attachments, and found, moreover, to have undergone a slow perforation, so that some of the adjacent parts jutted into the stomach, adherent to its perforated edges, and holding it firmly so as considerably to hamper its natural movements in the act of digestion.

This brings me to the next series, in which the chronic ulceration had been attended with a destructive process, gradual and slow perforation, but without the extravasation of digestive juices and materials that causes the danger in acute perforation if left too long in the peritoneal cavity.

TABLE II.—Operations for Chronic Ulceration with Slow Perforation.

No.	Date.	Name and Sex.	Remarks.
1	Nov. 21st, 1899	A. R. (F.), 28	Alive and well, June, 1902.
2	Oct. 15th, 1900	M. A. J. (F.), 50	Died 5 days after; stitches gave way; no peritonitis; necropsy.
3	Nov. 12th, 1900	M. F. (F.), 33	Alive and well, June 17th, 1902.
4	June 7th, 1902	C. R. (M.), 37	Died 5 days after; stitches gave way; purulent peritonitis; necropsy.

Case I was that of a woman, aged 28, who was brought in to Liverpool from Farnworth by Dr. Eatock, and operated on by me the same day, November 21st, 1899 (also briefly referred to in BRITISH MEDICAL JOURNAL for March 3rd, 1900, p. 515). Here a long course of dyspepsia, vomiting, and emaciation had led Dr. Eatock, after close observation of the case,

to diagnose slow perforation, which the exploration and subsequent procedures in the operation verified completely.

The left end of the stomach was the part found affected, and, after median incision of the epigastrium, the necessary access was secured by a cross incision to the left, through the abdominal wall below the ribs. The operation was a long and difficult one, a large hole being found behind the cardiac end, closely adherent to, and floored by, the liver. After detaching the adherent stomach and trimming the curled edges of its aperture, it was eventually found most feasible to separate the stomach into two portions and reattach them. The smaller one consisted of the cardiac orifice and a funnel-shaped piece continuous with it; the other was represented by the rest of the stomach, having a large hole at the top and back of its left end. After well stitching both mucous and serous coats, the abdomen was closed without drain. But an abscess formed, dribbling out of a part of the wound, which was further opened for the insertion of a glass tube, and after a few daily irrigations dried up and healed. Fortunately nothing worse happened, but it was easy to see that much more serious complications might have occurred. The patient got quite well and healthy.* In subsequent cases I have always used a drain of some sort from the first.

Case II was a private patient, a woman aged 50, nearly twice the age of the first. The state of the parts, and the operation itself, were almost identical with those of the first case. But I regret to say that the patient died exhausted five days later. All the stitches were found to have become loose, and the contents of the stomach leaked into the drained area, and issued at the wound. But no peritonitis ensued, the extravasation being completely cut off by effectual adhesions, as demonstrated *post mortem*. The stitches used in both cases were of similar strength and thickness, and the cause of the giving way had not transpired, either at the examination or for some time after. But perhaps a more recent similar occurrence may throw light upon this disaster.

Case III was a woman, aged 33, who had suffered from frequent pain in the stomach after food, and vomiting, which were only allayed by lying down constantly, and taking a diet almost solely of milk. The symptoms had lasted off and on for many years, but most severely for the five years preceding my notice of her. She had been carefully treated in hospital on several occasions for months at a time by my colleague, Dr. Caton, who transferred her to me in October, 1900. While lying in my ward she so far improved that I hardly thought operation necessary, especially as she was able to eat ordinary mixed diet without symptoms. But she declared that similar improvement had occurred several times, and would probably still continue if she remained in bed. Her difficulty was that she was debarred from making her living, as on resuming work as a cook a severe pain in the back returned at once, and necessitated the invalid diet which was insufficient unless at the same time she lay up. Under the circumstances I then appreciated the importance of making an exploration. This I did on November 12th, 1900, and found a hard mass, like that of malignant disease, on the small curvature. But cicatricial contractions outside suggested that the induration was inflammatory.

The stomach was opened in front and turned inside out, showing an ulcer the size of a florin with wide, hard, thick sides; the mucous membrane and muscular coat were gone, and nothing but peritoneal coat formed the floor of the ulcer, and perforation of that could easily have occurred at any time. The whole disease was excised, the hole thus left sewn up, mucous coat first and peritoneum afterwards, the same process being next applied to the exploratory opening into the organ. She made an excellent recovery and went to a convalescent hospital along with the third case of the previous series. She came to see me on June 17th, 1902, and again on October 20th, in good health, but not absolutely right. There is a hernia at the scar, and she feels some of her old symptoms to some extent. Possibly the stomach adheres to the liver or elsewhere. In any case, as she wishes to marry, I have advised her to submit to a further operation

* On June 20th, 1902, I met Dr. Eatock, who told me that she had never looked back, and was married, and in every way both vigorous and well.

(1) exploratory, to see if any adhesion of the stomach exists that may be freed; (2) a better closure of the abdominal wall, by close separate suture of the aponeurosis. Since my attention was called to this important detail by my colleague Dr. Grimsdale, during one of my operations in 1901, I have invariably practised it when closing openings in the linea alba, with the effect so far of preventing subsequent hernia. No. 5 in the first series is a case in point, in which no trace of hernia is to be found.

Case iv is that of a man, aged 37, who had been under the care of Dr. McCallum, of Kendal, for chronic indigestion which had lasted several years. He was admitted into the Kendal Hospital under the care of my brother, Dr. William R. Parker, who treated him by careful dieting and washing out the stomach for three weeks, and then sent him to me. The patient was very emaciated, and, not to keep him waiting, I operated the day after admission, on June 7th, 1902. On making an exploration through a median epigastric incision I found a state of affairs almost exactly like that found in Case iv of the series in Table I, but devoid of perforation into the peritoneum. An induration was found in the pyloric region, and cicatricial bands on the front of that region, indicating the healing of severe inflammatory change. There was no actual pylorus, the stomach being deformed and shrunk at that site, owing to contraction of ulcerative change. The stomach was opened and cut in two, the divided ends being reattached after removing a large adherent patch where chronic perforation, with adhesion behind, had occurred. Particular care was taken to use strong silk for the purpose, and two rows of sutures were put into the peritoneal surfaces, apposed, in addition to a previous row along the mucous edges. All through the operation I had a dread that the stitches might give way, and some of them actually did as I went on, and for that reason I put in an extra row all round, and in some places more still.

The patient did very well for two days, but throughout was subject to almost incessant biliary vomiting. It then became evident that he was not doing well; he became cold and collapsed, and died five days after operation, with symptoms, in addition, of abdominal tenderness, rapid further emaciation indicating probable peritonitis and septic poisoning.

A necropsy was made, extensive purulent peritonitis found, and a wide separation in the front of the attached surface, showing that here too the stitches had given way.

It is now pretty clear to me that this patient was probably not altogether fit to undergo the operation, owing to the previous exhaustion by starvation and pain. But for all that his progress for two days was satisfactory in all but the distressing vomit, which must have seriously tried the stitches. I am inclined to attribute the disaster mainly to the persistent vomiting, which, added to his previous weakness and malnutrition, prevented him from profiting by the operation. The same also seems to apply to Case ii of this series.

In similar cases where at the time I deemed the patients unfit to submit to any extensive operation, I have performed gastro-enterostomy with success. But even not always here. For instance, on December 12th, 1901, I operated in exactly the same manner on two men who had both suffered for a prolonged period from dyspepsia, vomiting, and other symptoms pointing to dilated stomach. In both cases I explored, and finding outside the stomach cicatricial evidences of internal ulceration and great attempts by Nature at spontaneous cure of the malady, I performed pyloroplasty, as the pyloric end of the stomach was narrowed, and hampered by the close proximity of a chronic ulcer, which did not seem to me capable of safe removal by excision. This did not take long, but in each case I also did gastro-enterostomy to relieve the pylorus and its neighbouring ulcer by a new and additional way out for the contents of the stomach.

One of the men, aged 43, somewhat feeble, died in three days of mere exhaustion apparently, while the other, aged 51, but more robust, made a good recovery, and reported himself in good health on February 26th, 1902, having started to work three days before. He also wrote on July 9th, and again on October 25th, 1902, saying that he could eat almost anything without any discomfort, and follow his employment.

In Table III I give these two and five other pyloroplasties, without further comment on the first five than the remarks in the table.

TABLE III.

No.	Date.	Name and Sex.	Remarks.
1	Aug. 14th, 1895	E. S. (F.) 38	Healed well. Return of symptoms 1899.
2	July 3rd, 1899	42	Pylorus explored; adhesions separated; pyloroplasty repeated. Healed well and quickly. January, 1900, wrote saying occasional indigestion and constipation. July 19th, 1902, wrote saying quite well; no stomach trouble; forgets what indigestion is like.
3	May 5th, 1897	J. D. (M.), 52	Ulcerated induration in stomach found. Suspected then to be carcinoma and not interfered with. November, 1897, called complaining of acid eructations. March 26th, 1900, wrote complaining that he was troubled more and more with his old trouble (dyspepsia and flatulence). June 18th, 1900, wrote saying that he was in fairly good health. This indurated ulcer was probably a gumma.
4	Jan. 23rd, 1899	G. L. (M), 21	Small unhealed ulcer found in stomach near pylorus; not interfered with. Reported quite well October, 1902.
5	Sept. 20th, 1899	H. B. (M), 46	An extraordinary case of superficial ulceration of mucous membrane over the right half of the stomach. Had gained weight two months later. A year later succumbed after gastro-enterostomy. Patient of Dr. Wilding, Hindley, Wigan.
6	Dec. 12th, 1901	T. H. (M), 43	Pyloroplasty and gastro-enterostomy. Died after 3 days; no repair.
7	Dec. 12th, 1901	R. L. (M), 51	Pyloroplasty and gastro-enterostomy. Made good recovery and was in excellent health July 9th and October 25th, 1902.

The Croonian Lectures

ON THE

NATURAL HISTORY AND PATHOLOGY OF PNEUMONIA.

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LECTURE III.—[ABSTRACT.] AGGLUTINATION.

ARKHAROW, Issaef, and Mosny found that pneumococci grew in a special manner in the serum of immunized animals. Early in 1895 I observed that the pneumococcus, in the form of diplococci, gave rise to a uniform turbidity in normal rabbit's serum; in immunized rabbit's serum, however, the cocci sank to the bottom in the form of a sediment, and the serum remained clear; these cocci were clumped together in masses, and sometimes formed very long chains, and I then stated that the mode of growth was a good indication of the protective power of the serum.

Eyre and I made a number of observations upon the agglutinative power of various serums, using different dilutions and testing both virulent and avirulent forms of pneumococci. We found that the quantity of agglutinin formed in the blood during the process of immunization was exceedingly small; for example, normal rabbit serum would cause agglutination in a strength of 25 per cent. at the end of twenty-four hours, while immune serum only agglutinated in the strength of 12.5 per cent.

We failed to find any definite relationship between the agglutinative power and the protective action of the various serums. Pane likewise found that the highest limit for agglutination were the following dilutions of the serum of an immunized rabbit, 1 in 15; of an immunized cow, 1 in 25; and of an immunized donkey, 1 in 30; while in order of protective power the donkey's serum came first, the rabbit's second, and the cow's last. Bezancon and Griffon¹ made observations upon the agglutinating power of the serum with the object of determining whether it could be used for diagnostic purposes, and the method which they adopted was to sow the