be struck with the fact that in many of the successful cases there had been long antecedent visceral or peritoneal trouble.¹⁵

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TWO CASES OF SUBPHRENIC PYO-PNEUMOTHORAX,

WITH REMARKS UPON THE RELATION OF THAT CONDITION TO GENERAL PERITONITIS WHEN CAUSED BY PERFORATING GASTRIC ULCER.

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THE name "pyo-pneumothorax subphrenicus" given by Leyden to circumscribed collections of gas and pus in the peritoneal cavity immediately beneath the diaphragm is open to objection on account of its inaccurate though pictorial character, and, philologically, as regards the adjective. However, the best name is that which indicates clearly the situation of the pus and its association with gas, and Leyden's term satisfies these requirements more nearly than any hitherto proposed, and, besides, is suggestive of complications truly thoracic. To call such peritoneal collections of pus abscesses is to confuse them with abscesses as ordinarily understood, such as those in the retroperitoneal tissue, which may be equally subphrenic. It is, perhaps, better to describe all collections of pus in a previously existing cavity as empyemata, but when their essential characteristic is association with gas, the term empyema is clearly insufficient.

The causes of subphrenic pyo-pneumothorax are perforations from various lesions of air-containing viscera—stomach, duodenum, or other parts of the intestine—but by far the most frequently perforations of simple gastric or duodenal ulcers. In the case of the stomach, the gas and pus collect generally beneath the left wing of the diaphragm, limited on the right by the falciform ligament. In the case of the duodenum the result is a similar collection, generally to the right of the falciform ligament.

Of the various causes, perforation of the stomach is so much more frequent than the others, that in dealing with the records of but one hospital, I thought it best to confine my analysis to perforation of this viscus and of the duodenum, the latter being included because the majority of simple duodenal ulcers are similar pathologically to those of the stomach, and, whether perforated or not, are not easily distinguished clinically.

The first of the two cases related was an exquisite example of subphrenic pyo-pneumothorax. Its origin, which happily remains uncertain, was probably an unusual one; but perhaps the chief claim of the case to be recorded is that its treatment was completely successful, certainly a rare termination to such a condition.

The second case was less remarkable, but was a characteristic example of its kind, with a characteristic complication to which the death of the patient was due. This case is included in the table given below.

CASE I.—B. E., aged 42, a bricklayer at a silver refinery, was admitted into St. George's Hospital on May 11th, 1893, and came under the care of Dr. Owen. He stated that he had been liable to dyspepsia and constipation for most of his life, more especially the last five months, during which he had been constrained to sedentary habits by a scald of one of his feet, barely healed at the time of admission. For three weeks before admission he had been suffering from painfulness and increasing prominence of the upper abdomen. On the evening of May 3rd he was attacked by severe pain like colic in the lower abdomen and at the navel, with which he was "doubled up for two hours." During the following week he kept his bed, having much sweating though no rigor.

When admitted on the afternoon of May 11th he was found to be a thin, wiry-looking man, feverish, and complaining chiefly of pulmonary

symptoms. He was short of breath, with some cough and scanty unstained expectoration, and at the base of the right lung behind were dullness and tubular breathing. The upper abdomen presented a tympanitic prominence, tender on percussion, the nature of which was not at first quite clear. In the course of the next three days the abdominal swelling increased, as did also the embarrassment of the right lung, while the patient acquired a dull aspect and complained of much discomfort. Respiration 42, pulse 94.

a, area of tympan. resonance; b, incision; c, edge of liver.

Nine Cases of Incompletely Circumscribed Peritoneal Suppuration associated with General Peritonitis.

No.	Year.	Sex.	Age.	Situation of Perforation.	Description of Peritonitis.	Thoracic Complications.
278	1845	F.	46	Ant. and post. walls of stomach	Hypochondria and epigastrium circumscribed by adhesions	Pleurisy and red hepatisation at bases of both lungs.
325	1860	M.	61	Ant. surface of stomach near small curvature	Grumous fluid especially in front of left lobe of liver (apparently encysted)	—
278	1877	F.	23	Ant. surface of stomach near cardia	Left hypochond. converted into cavity holding over Oij	—
101	1888	F.	24	Scar of ulcer on post. surface of stomach	Abscess between stomach and diaphragm; foul pus (Oj)	Pericarditis.
355	1888	F.	23	Ant. surface of stomach	Imperfectly closed cavity (Ojss) between left lobe of liver, diaphragm, spleen, and stomach	—
45	1889	M.	42	Ant. surface of stomach near pylorus	Incompletely closed cavity between left lobe of liver and stomach	—
301	1889	F.	58	Ant. surface of stomach just below small curvature and three inches from pylorus	Abscess between left lobe of liver, stomach, and diaphragm	Adhesions at base of left lung.
190	1891	F.	21	Ant. surface of stomach	Abscess between cardiac end of stomach, spleen, left lobe of liver, and diaphragm	Lower lobe of left lung collapsed; pleurisy at base of right lung.
107	1893	F.	19	Post. surface of stomach and small curvature	Abscess close to pylorus; ragged cavity behind stomach (recent laparotomy)	—

Fifteen Cases of Completely Circumscribed Peritoneal Suppuration.

No.	Year.	Sex.	Age.	Situation of Perforation.	Description of Peritonitis.	Thoracic Complications.
12	1842	F.	25	Ant. surface of stomach	Abscess (fœtid pus) left hypochond., limited by falciform ligament	Pericarditis and left pleurisy.
87	1843	F.	20	Post. surface of stomach	Large abscess between right lobe of liver and diaphragm	Communication with bronchi of right lung.
71	1879	F.	16	Small curvature of stomach	Large abscess in left hypochond.; thin pus Oij—iij	Ulceration of diaphragm and pleurisy at base of left lung.
50	1856	F.	19	Œsophageal end of stomach	Large collection of pus in left hypochond.	Diaphragm perforated; empyema of left pleura.
153	1861	M.	36	Duodenum just beyond pylorus	Abscess (grumous pus), upper and lower surfaces of liver, right	Diaphragm perforated; right lung adherent to diaphragm.
96	1861	F.	61	Small curvature of stomach near pylorus	Large collection of air limited to upper abdomen	—
90	1865	F.	21	Near cardiac end of stomach	Vast collection of pus, whole left side of abdominal cavity	Adhesions between left lung and diaphragm; lung somewhat compressed.
196	1878	F.	61	Near small curvature of stomach	Abscess in left lobe of liver; subcutaneous abscess beneath xiphoid	Both wings of diaphragm perforated; broncho-pneumonia at base of right lung.
356	1887	F.	24	Post. surface of stomach	Abscess between diaphragm and liver, limited on right by falciform ligament	Left pleurisy.
104	1890	F.	22	Post. wall of stomach	Abscess between left lobe of liver, diaphragm, spleen, and ant. abdominal wall	Empyema of left pleura.
1	1891	F.	18	Ant. wall of stomach near cardia	Abscess (air and pus) between diaphragm, spleen, left lobe of liver, and ant. abdominal wall; ragged abscess in spleen	Turbid effusion in left pleura.
389	1891	F.	21	Ant. wall of stomach	Cavity bounded by falciform ligament, upper surface of left lobe of liver, and ant. surface of stomach (recent operation)	Fibrinous pleurisy on left side; and collapse of lower lobe of lung.
65	1892	F.	21	Puckered spot at cardiac end of stomach on ant. wall	Sinus from operation wound (six weeks), over left lobe of liver to branching abscess around spleen	Diaphragm perforated; abscess in lower lobe of left lung.
104	1892	M.	40	Post. surface of stomach	Abscess, bounded by falciform ligament, diaphragm, spleen, stomach, and ant. abdominal wall (recent operation)	Left pleurisy; lower lobe of left lung collapsed.
328	1893	F.	27	Cicatrix on small curvature and post. surface of stomach	(Operation seven weeks before); abscess cavity (left) contracted; stomach adherent to left lobe of liver	Empyema of left pleura.

By May 14th the physical signs had become very pronounced, and were as follows. The upper abdomen was bulged out by a rounded swelling occupying chiefly the right hypochondrium and epigastrium, extending across the middle line to the left, limited below by a transverse line of hardness, which was evidently the edge of the liver displaced downwards. A tympanitic percussion note and exquisite bell sound were obtainable over the swelling, and over the normal area of hepatic dulness as high as the nipple, as shown in the figure. There was no amphoric breathing. The thoracic movements were exaggerated, the right chest moving as freely as the left. The heart's apex was but little displaced, being in the left nipple line and fourth interspace. At the posterior base of the right chest breath sounds were absent and fremitus nearly so; above this was an area of dulness, and tubular breathing extending nearly as high as the scapular spine. A few rales were heard in the left axilla, but the back of the left lung was normal. From these signs it was clear that the condition to be dealt with was not a true pneumothorax, but a collection of gas below the diaphragm compressing the right lung.

On May 15th a consultation was held, and an operation agreed upon. Accordingly, the same afternoon, chloroform was given, and Mr. Rouse operated with the assistance of Mr. Dent. The abdominal wall was divided by the incision indicated in the figure, giving vent to a large quantity of foul gas, upon the escape of which the swelling immediately collapsed, and subsequently to about two pints of thin pus mixed with flakes of lymph. These were the contents of a large circumscribed cavity between the right lobe of the liver and the diaphragm, from which a track led downwards over the edge of the liver to an indurated spot below the umbilicus, suggesting that the mischief had originated about the appendix cæci. There was, however, no present communication with the appendix

or other part of the intestine. A glass drainage tube was passed down to the indurated spot, and a long rubber was placed over the liver.

After the operation the patient did remarkably well. He was propped up as much as possible so as to favour drainage, but the discharge was never very foul or abundant, and by June 5th it had ceased. The right lung rapidly recovered, and on June 11th the physical signs were normal in both chest and abdomen. At the end of the third week of June he began to leave his bed, and on July 25th he was sent to the Convalescent Hospital at Wimbledon. At this time he was in very fair health, complaining only of some discomfort in the right hypochondrium, probably referable to adhesions forming about the liver. On October 4th he was seen at St. George's, free from the discomfort mentioned above, slightly dyspeptic, but practically well.

CASE II. (From clinical notes by Dr. Cyril Ogle, medical registrar.)—M. McL., aged 27, a housemaid, was admitted on July 18th, 1893, under the care of Dr. Whipple. There was a history of old anæmia and dyspepsia. Fourteen days before admission she had been attacked by sudden severe pain at the epigastrium with vomiting, and, a week later, by symptoms of pleurisy on the left side. On admission a subphrenic abscess in connection with a perforating gastric ulcer was diagnosed, there being a tympanitic prominence in the epigastrium, the tympanitic note extending to the left and upwards as high as the nipple, besides which there were signs of left pleural effusion with compression of lung. In the course of three days these signs increased and extended, and a modified bell note became obtainable over part of the tympanitic region.

On July 22nd Mr. Pick opened the abdomen above the umbilicus, finding a circumscribed cavity beneath the diaphragm, into which the left lobe of the liver projected, containing foul gas and pus mixed with

fatty food. The perforation in the stomach was not found, being probably closed. On August 12th an empyema of the lower part of the left pleura was opened, giving exit to pus which was very foul, although there was no perforation of the diaphragm. The abdominal wound was healed by August 28th, and for nearly a fortnight afterwards the patient made good progress; but then diarrhoea and other symptoms of septic poisoning set in, and she succumbed on September 15th.

The necropsy was made by Dr. Rolleston, who found that there had been no general peritonitis, and that the subphrenic abscess had entirely contracted. There was a cicatrised ulcer on the small curvature and posterior surface of the stomach adherent to the pancreas, the neighbouring part of the stomach being adherent to the under surface of the left lobe of the liver. In the upper part of the left pleural cavity was a small quantity of pus. The lower part of the cavity, where the empyema had been originally, was partly closed by adhesions.

With the view of comparing the frequency of general peritonitis and limited peritoneal suppuration or subphrenic pyo-pneumothorax, as results of simple gastric and duodenal ulcers, I have examined the *post mortem* records of St. George's Hospital, which extend over a period of more than fifty years, having been begun with the year 1841. These records contain 37 examples of perforation of simple gastric or duodenal ulcers into the general peritoneal cavity without any or with but slight attempt at limitation, 25 of which were gastric, 12 duodenal. Of the duodenal ulcers one was the acute sequel of a burn.

The examples of more or less completely circumscribed peritoneal suppuration from the same causes are 24 in number, 23 of which were due to gastric perforation, one to duodenal. These are given in the tabular form.¹ Nine were incompletely circumscribed, 15 completely. Many of the latter must from their origin in perforation of an air-containing viscus, and situation immediately beneath the diaphragm have been of the nature of subphrenic pyo-pneumothorax, though it is in a small proportion only that the presence of gas in the cavity is mentioned in the *post-mortem* description, or, as having been recognised during life, in the accompanying clinical history.

As regards the stomach, this analysis of forty-eight cases of perforation into the peritoneal cavity may be taken as giving a fair representation of the chief results of such perforation, perhaps warranting a generalisation.

The most important point brought out is that in a large proportion (in the present analysis nearly half) of the cases of gastric perforation, no matter in what part of the stomach the perforation may be, the extravasation and peritonitis are more or less limited at first. In most cases where general peritonitis is found at the *post-mortem* examination the inflammation is most intense in the subphrenic region, perhaps the more solid of the extravasated gastric contents remaining here in a cavity half closed by adhesions; while sometimes the extravasation has clearly taken place into a cavity so circumscribed that the peritonitis became generalised merely by the rupture of an adhesion some days after the perforation. In fact there are all degrees of transition between a perfectly unlimited peritonitis and a typical subphrenic pyo-pneumothorax.

The practical importance of this point has been illustrated by the formation of a subphrenic collection of pus after laparotomy for general peritonitis, the site of the earliest extravasation from the stomach having probably escaped thorough cleansing at the operation,² and by the recent experience that secondary suppuration in the chest is to be feared even after the abdomen has been opened for general peritonitis of but a few hours' duration.³

The table, amplified as it is from a previous paper, further substantiates other points to which attention was there directed, such as the partiality of subphrenic pyo-pneumothorax for the left side of the abdomen with boundaries which are in many cases very similar, and the frequency and nature of the thoracic complications which add so seriously to its fatality.

Among the more recent publications dealing with the subject of subphrenic pyo-pneumothorax or the treatment of perforating gastric ulcer to which reference has not been made either here or in the papers quoted are the following:

R. F. Weir, *Laparotomy for Perforating Round Ulcer of the Stomach*,

¹ Ten of these cases have been already published by Dr. Penrose and myself, *Clin. Soc. Trans.*, vol. xxvi. In this paper the same question was considered, but on less of a basis.

² Taylor, *Birm. Med. Rev.*, 1888.

³ Kriege, *Berl. klin. Woch.*, Dec. 5th, 1892; Haward and Dickinson, *Clin. Soc. Trans.*, vol. xxvi.

Internat. Med. Mag., February, 1892; S. Pozzi and E. Ricklin, *De l'Intervention Opératoire dans les Cas de Perforation d'un Ulcère Simple de l'Estomac*, *Rev. Intern. de Thérap. et de Pharm.*, January 18th and 30th, 1893; J. W. Taylor, *On the Surgical Aspects of Peritoneal Perforation*, *Provinc. Med. Journ.*, May, 1893; Clifford Allbutt, *A Clinical Lecture on Sub-diaphragmatic Abscess*, *Clin. Journ.*, June 7th, 1893; R. A. Stirling, *Case of Perforating Ulcer of the Stomach, Laparotomy, etc.*, *Austral. Med. Journ.*, June 15th, 1893; C. Vaulair, *Contribution à l'Étude des Abscès Sous-diaphragmatiques Gazeux*, *Rev. de Médecine*, July 10th, 1893; A. L. Mason, *Subphrenic Abscess, with special reference to those Cases which simulate Pyo-pneumothorax*, *Trans. Assoc. Amer. Phys.*, 1893; W. F. Haslam, *Some Points in the Surgical Treatment of Simple Ulcer of the Stomach*, *BRITISH MEDICAL JOURNAL*, November 11th, 1893.

A CASE OF ENTERECTOMY FOR GANGRENOUS BOWEL.

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THE following case, together with one reported by Dr. Horrocks, of Bradford, disposes of an objection which has been urged against my operation, namely, that it would not always be possible to invaginate the enlarged proximal end of the bowel into the distal shrunken end, and that in such cases it would therefore be useless. I was quite aware before by experiments that it was apparently as safe to invaginate against the flow of the faecal current as with it in healthy dogs; but I was far from sure that the same would prove to be the case under the different conditions associated with strangulated bowel, and I did not intend to practise invagination upwards in the human subject until it was absolutely necessary to do so. There are now two cases in which the operation has been done in this way, and both have made a rapid and complete recovery, and it may therefore be conjectured that it is practically unimportant which way the bowel is invaginated, though I think the downward method should be preferred when feasible.

S. R., aged 51, came under my care at the Royal Infirmary on June 20th, 1893. She was a rather delicate-looking woman, had never been very strong since she suffered from spinal curvature as a child of 11. Early in December, 1892, a week after lifting a heavy weight, she first noticed a lump in the left groin; it was soft and painless, and had remained there ever since. For a few months she had been subject to attacks of vomiting near the menstrual period, but they had not been accompanied by any change nor pain in the lump. One of these attacks commenced very suddenly on June 14th, and continued on the two following days. On June 17th she was put under medical treatment, and the vomiting remained in abeyance until June 19th, when it returned and was inclined to become stercoraceous. There had been no movement of the bowels nor passage of flatus since June 14th.

When the patient was first seen on June 20th the abdomen was slightly distended; there was severe umbilical pain, absolute constipation, and vomiting, together with a small femoral hernia, tense but painless. Her general condition was quiet, pulse under 90, temperature 98.2°. She was at once taken to the operating theatre, and placed under the influence of chloroform. When the sac was opened the small knuckle of bowel exposed looked recoverable, but, upon releasing the constriction, and drawing down a little more bowel for inspection, it was found that on the proximal side there was a line of ash-grey slough, through which the contents began to ooze. The entire length of constricted bowel was 1½ inch, and on the distal side there was no distinct slough. An incision was next made in the median line of the abdomen between the umbilicus and the pubes, and a sponge was introduced and placed beneath the inner opening of the hernial sac. Then, after cleansing the bowel in the sac, it was reduced with the left hand outside, and rapidly withdrawn from the abdomen with the right hand, previously placed inside to receive it. The peritonum was not at all soiled in the process. The bowel was then clamped above and below, the injured part quickly cut out with scissors, the bleeding points tied, and one of my bone tubes (1 inch by 1½ inch), sutured into the upper end. In this case, however, the upper end was very dilated and thickened, and it proved impossible to invaginate it into the shrunken lower end. The tube was therefore changed for a smaller one (¾ inch by 1½ inch), which was sutured into the lower end. The traction thread was passed, the cut ends attached, and invagination performed as described in a previous case.¹ The only difference—a marked one—being that the bowel was invaginated upwards instead of downwards, a variation which was not found to increase the danger in the original experiments on dogs. As the traction thread had been passed through distended and, perhaps, partially paralysed bowel, the needle puncture was secured with a single Lembert suture. Very fine green catgut was used for all internal sutures, and fishing gut for the abdominal wall. The abdomen was closed without drainage, after sponging out of the peritoneal cavity a little blood-stained serum which was present before the operation. The hernial wound was only closed above, the lower part being left open for drainage. The entire operation, including the administration of chloroform, lasted 1½ hour.

The patient soon recovered from the shock of the operation, which was

¹ *Clinical Society's Transactions*, 1892.