PHLEGMONOUS GASTRITIS[1]

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Phlegmonous gastritis is a rare condition described since ancient times, beginning with Galen. It is an infection of the stomach wall characterized by sero-purulent or fibrino-purulent inflammation, chiefly localized in the submucosa, but more or less involving other layers. It may occur either as a phlegmon or as an abscess or as a combination of the two. The phlegmon may be diffuse or circumscribed. In ancient literature, only the abscess form was recognized.

The first accurate pathological description of a phlegmon was made by Cruveilhier (1820). In Raynaud's collection (1861) half the cases were abscesses, and the other half phlegmons. Later, with the advent of abdominal surgery, phlegmons were more easily recognized so that in Sundberg's collection of 215 cases (1919), 85 per cent. represented phlegmons, 12 per cent. abscesses, and 3 per cent. a combination of the two. Of the 185 phlegmons, 158 were diffuse, and 27 circumscribed.

With the larger material available during recent years, it is apparent that the process may vary greatly in its intensity, as illustrated by certain subacute and chronic types to be mentioned later.

The acutely inflamed stomach wall is usually dense and rigid,[2] but in some cases may be of soft, spongy consistency. Thickening of the wall may be little more than normal, or may reach a degree described in Hall and Simpson's case, where relative size of wall and cavity bore a striking resemblance to that of the uterus. Circumscribed phlegmons and abscesses occur more frequently in the pyloric region than elsewhere. Abscesses of the stomach wall have been known to reach the size of a Bartlett pear. While most phlegmons can be diagnosed grossly, a definite number of others merely show an acute swelling, the character of which can only be determined by microscopical examination.

The mucous membrane is at times unchanged, both on gross and on microscopical examination, at other times, all varieties of thickening and all degrees of œdema as well as hyperæmia, punctiform hemorrhages, hemorrhagic erosions, and ulcerations, may be found. Moreover, there may be perforations of the mucosa, thus permitting spontaneous drainage into the gastric cavity. Involvement of the muscularis and serosa is common. Peritonitis occurs in from 60 to 70 per cent. of the cases, but is not invariable. In one-third of the fatal cases there was no peritonitis (Sundberg). Left-sided pleurisy, pericarditis, and bronchopneumonia have been complications.

[1] Read before the New York Surgical Society, January 12, 1927.

[2] Virchow, at the autopsy on a case of Ackerman's, remarked that if such a condition involved the skin it would be called a carbuncle.

Streptococci are the organisms most frequently found (70 per cent.); but staphylococci, pneumococci, B. coli, and B. subtilis also occurred.

Phlegmonous gastritis occurs mostly in the working classes, and is three times as frequent among men as among women. The majority of the patients are between twenty and sixty years of age.

As constitutional predisposing causes may be mentioned, exhaustion from hard labor, alcoholism, chronic gastritis, and hypoacidity of the gastric juice. The bactericidal properties of normal gastric juice and, conversely, the increased likelihood of infection definitely associated with low acid figures, must both be taken into account. Sundberg states that there was no history of hyperacidity or even of normal acidity of the gastric juice in the cases he reviewed. This observation is confirmed in a majority of the cases which the author has been able to collect since that time, in which gastric analyses were reported. In this connection a report of Stieda is of interest. In 64 cases of gastric operation on patients with low acid values, post-operative infections developed in 17 (30 per cent.), while in 35 cases in which the acidity was high or of normal value, there were only 2 (6 per cent.) cases of infection.

Bumm's recent experiments *in vitro* demonstrate the antiseptic qualities of normal gastric juice. He maintains that in anacid stomachs bacteria remain alive. If stagnation be present, the products of decomposition favor bacterial growth and increased virulence.

There are a few instances in which trauma has played a definite etiological rôle. In chronic gastritis the mucosa is more susceptible to trauma than when normal, and it must also be remembered that streptococci can penetrate mucous membrane without causing a local reaction at the point of entry. Actual injury to the gastric mucosa by chemicals and drugs or by the poisons of spoiled food (see below) is occasionally noted in the etiology. External trauma, such as that caused by the kick of a horse or a fall from a scaffold, striking the epigastric region, is of occasional etiological importance. Gastric phlegmon has been associated with ulcer or cancer of the stomach in over 50 cases.[3]

Phlegmon of the stomach rarely occurs as part of a general sepsis with purulent metastases in various organs. On the other hand, certain unknown predisposing factors may exist, for it was noted that during a large epidemic of puerperal sepsis in Prague in 1847, several cases of phlegmonous gastritis were observed among those coming to autopsy. Cases of phlegmonous gastritis are also seen following erysipelas [4] or furunculosis.

A man of forty-nine years (reported by Sundberg), suffering from chronic pulmonary tuberculosis, after five days' ingestion of potassium iodide, developed a severe pustular acne; his general condition became poor; and he died within a week. At autopsy a large recent ulcer at the pylorus was found, while in other parts of the mucosa there were areas of suppuration varying in size from a pea to an almond, with

[3] See Cases Nos. 45, 46 and 47 in appended table more fully reported as Cases I, II and III in text.

[4] See Cases Nos. 10 and 45 (Case I in the text).

small perforations into the lumen of the stomach. Similar lesions existed in the duodenum and upper jejunum. These suppurative foci grossly resembled the acne pustules of the skin and the larger ulceration at the pylorus was held to represent a carbuncle. Microscopical examination of the uninvolved gastric mucosa showed chronic gastritis.

Besides erysipelas, furunculosis, and puerperal sepsis, as just noted, gastric phlegmon has occurred in connection with smallpox, scarlet fever, acute polyarthritis, and pyæmia.

Direct contact of the gastric mucosa with infectious material has also been followed by phlegmon. For example, it has occurred after tonsillitis, stomatitis, pharyngitis, purulent bronchitis, drainage of abscesses of the oral pharynx, and extraction of carious teeth. In one case it followed a meal of calf's liver from an animal which had probably died of sepsis. In another instance, all the guests at a party became gravely ill after a meal, but only one died, and autopsy showed a phlegmonous gastritis.

Lastly, there is a large group in which no ascertainable cause exists—the so-called primary idiopathic form.

The typical symptoms are: Sudden onset, with profound prostration, high fever, chills, intense epigastric pain and tenderness, repeated severe vomiting, and more or less local rigidity. A symptom first noted by Deininger (1879) and occasionally confirmed since then is lack of pain when the patient is made to sit up. This symptom was observed by Sundberg independently. In some cases of spontaneous recovery from gastric abscess, a definite tender epigastric tumor has developed in the course of days, and spontaneously subsided after the vomiting of pus. Graphic descriptions of these are quite frequent among the earlier reports.

The vomiting of macroscopic pus or the presence of bacteria in the vomitus are rare. Macroscopic pus in the stools has occasionally been noted. As a rule, the white blood cell count is high—between 20,000 and 30,000. Extreme restlessness up to within a few hours before death has been noted; in other cases there was marked apathy.

Diagnosis is rarely made before operation. Usually the condition is mistaken for acute perforated gastric ulcer, acute pancreatitis, or acute cholecystitis. High fever and lack of increased pain upon sitting up (Deininger's symptom) speak for gastric phlegmon as against perforated gastric ulcer. Before the onset of peritonitis (as noted elsewhere this was absent in one-third of the fatal cases) abdominal puncture would be negative, both in phlegmonous gastritis and in acute pancreatitis. Abdominal puncture after the onset of peritonitis would exclude acute pancreatitis. With the abdomen opened, the condition has been recognized in the acute fulminating type by a number of observers. On the other hand, it has been mistaken for a neoplasm in chronic cases, and only upon examination of the resected specimen has the actual diagnosis been made. Aspiration of pus from the thickened gastric wall with a fine needle has been of diagnostic aid a number of times.

The average duration of the disease is one or two weeks, but several deaths have occurred within a few hours of onset. The mortality is 92 per cent. (Sundberg).

Regarding surgical efforts to control this condition, it may be noted that success has been reported following simple drainage down to the gastric peritoneum, gastrostomy, and gastro-enterostomy; but these cases may be classed as examples of spontaneous recovery. There have been eight successful resections if we include Cases IV and V of Bircher for so-called gastritis putrida, which he maintained is a beginning stage of phlegmonous gastritis. The successful cases of Koenig (one, 1911) and Dahlgren (two, 1918) were of long standing and afebrile; and the pre-operative diagnosis was carcinoma. Zoeffel's (1913) patient was ill for six days; there was no fever; the pulse was 64, and the pre-operative diagnosis was slow perforation of a gastric ulcer. Orator (1926) operated for acute perforation of a gastric ulcer on the greater curvature, 19 cm. from the pylorus, around which was an area of circumscribed phlegmonous gastritis the size of a saucer. The two successful resections of Bircher for gastritis putrida were done on chronic cases with pre-operative diagnoses of pyloric stenosis. Novak (1919) successfully performed pylorectomy for a large submucous abscess.

The recent important contribution of Orator, from Von Haberer's clinic, draws attention to phlegmonous gastritis of the stomach as a post-operative complication. Four cases are reported. The first followed gastro-enterostomy for an inoperable carcinoma of the pylorus in a young woman. The second case was that of a man of twenty-nine. Gastro-enterostomy for duodenal ulcer had been done in 1919; jejunostomy for gastrojejunal ulcer with dense extensive adhesions in 1921; and subtotal gastric resection for gastrojejunal ulcer in 1922. There followed a phlegmonous infiltration of the submucosa around the anastomosis which involved the seromuscularis, causing a fatal peritonitis. (The total acidity varied from 62 to 74 in this case.) The third case followed resection (Billroth II) for a chronic ulcer diagnosed as carcinoma.[5] The fourth (Orator's own) was that of a man of forty, on whom a Billroth I resection for duodenal ulcer was done. The patient died on the fifth day with signs of gastric retention. Autopsy showed a greatly dilated stomach; there was no leak at the suture line and no peritonitis. The duodenum and jejunum were dilated up to a point 20 cm. beyond the duodenal-jejunal flexure. Grossly, there was marked swelling of the gastric wall; but only on microscopical examination was it ascertained that a typical phlegmonous gastritis existed. Orator points out that such post-operative inflammatory changes (of a less severe character) may occur more often than one would imagine. Moreover, it is possible that such inflammatory reactions confined to the region of a gastro-enterostomy opening may constitute a predisposing factor for subsequent development of peptic ulcers in this locality. Therefore, he advises routine microscopical examination of stomach tissue from those dying with the symptoms of persistent gastric dilatation, especially when peritonitis is absent.

In every large series of gastric carcinomata there are reports of patients who remained well years after palliative operations. It has been noted above

[5] These three cases occurred at Von Eiselsberg's clinic.

that the pre-operative diagnosis in the cases of Koenig and Dahlgren was tumor; and that only after resection was the true condition recognized. Orator cites the case of a man of sixty-three with an apparently inoperable carcinoma growing to the anterior abdominal wall, arising from the lesser curvature with involved lymph-nodes reaching to the cardia, for which gastro-enterostomy with entero-anastomosis was performed. Seven years later the patient reported himself in good health.

The extensive inflammatory changes noted in linitis plastica, which often are extremely difficult to distinguish from scirrhous carcinomatous involvement, may represent the final stage of a subacute diffuse phlegmon of the stomach.

Lastly, among a large series of resected stomachs Orator found four cases of hour-glass contracture, in which submucous cicatricial changes extended far beyond the customary distance of involvement around ulcers—conceivably the end-stages of healed phlegmons.

The case of Stapelmohr (40 in the appended table) seems to prove this point. A woman of forty-eight years was operated on eleven days after the onset of symptoms. A phlegmonous gastritis was found, the inflammation involving the omentum, transverse colon, mesocolon, and gastrocolic ligament. Pus aspirated with a fine needle from the gastric wall showed streptococcus and B. subtilis. Five years later examination of the patient, who was then in perfect health, showed absence of free hydrochloric acid and an hour-glass contraction of the lesser curvature.

From the foregoing evidence one must conclude with Sundberg and Orator that there are many cases of phlegmonous gastritis which recover and are not diagnosed as such.

In 1919, Sundberg published a most comprehensive monograph which included a review of 215 cases. In addition to these, the author has been able to collect 48. Of this number, 5 cases were found among 5200 autopsies at Mount Sinai Hospital. The material from one case has previously been demonstrated and appears in the literature. The four others are now published for the first time. A surgical summary of these 263 cases is appended. In passing, it may be mentioned that among 1200 autopsies at the Lenox Hill Hospital no example of phlegmonous gastritis was encountered.

The five case histories and autopsy reports from Mount Sinai Hospital follow in brief:

CASE I.—*Phlegmonous Gastritis; Ulcer; Erysipelas.*—Solomon W., fifty-two years, admitted to the medical side of Mount Sinai Hospital, July 8, 1909. Previous history was negative except that the patient had been in the habit of taking two or three whiskies daily before meals. There was also a history of erysipelas of the leg five weeks before admission.

The present illness began five days before admission, with sharp epigastric pain, frequent vomiting, chilly sensations, but no actual chill, and high fever. The patient was markedly prostrated, but after three days felt better and got out of bed, weak but comfortable. The pain returned twelve hours before admission, with fever, marked prostration, and dyspnœa. The hands and feet were blue. There was a diffuse erythema over the entire body.

Physical examination showed an almost moribund man, with marked dyspnœa and cyanosis; the pulse was rapid and weak. In the upper abdomen there was a firm, exceedingly tender, smooth mass, filling the entire epigastrium. The abdomen was moderately distended, but there was no free fluid. The legs showed healed ulcers, with irregular, well-defined, dull bluish areas around them. The patient died two hours after admission.

Autopsy No. 1802. Serous peritonitis. Lower end of œsophagus involved (4 cm. from cardia). Entire stomach wall thickened and œdematous. Small ulcer on greater curvature, 5 cm. from pylorus. Duodenum normal.

Microscopical examination: Acute suppuration of all coats of œsophagus and stomach, except mucous membrane, which was slightly involved.

Culture from submucosa of stomach showed streptococci. Spreads from involved areas of leg and thigh after long search showed single chain Gram-positive cocci.

CASE II.—*Phlegmonous Gastritis; Peptic Ulcer; Gastro-enterostomy.*—Clara S., single, twenty-seven years, admitted to Mount Sinai Hospital (service of Dr. Alfred Meyer), June 29, 1913. No previous history of gastric trouble.

Six days before admission the patient suffered from headache and fever, no chills. For the first three days she vomited three or four times daily, on the fourth day vomiting was incessant. The vomitus was foul smelling and dark green; no blood was present at any time. There was no pain and no jaundice.

Physical examination on admission showed abdomen lax. There was slight tenderness over gall-bladder. Meltzer test positive. Rest of examination was negative. The temperature on admission was 104. Blood count gave white cells, 20,000; polymorphonuclears, 81 per cent. The temperature varied from 100 to 105 daily.

On July 3 the patient was seen by Dr. A. V. Moschcowitz, who made the diagnosis of probable appendicitis, with possible complicating pylephlebitis, and advised operation. The patient was transferred to the service of Dr. A. G. Gerster. The white blood-cells then were 22,900; polymorphonuclears, 87 per cent.

At operation the same day (Doctor Moschcowitz) the stomach was found matted to the duodenum with yellowish-green fibrin, which extended along the greater curvature towards the cardia. The stomach and duodenum were markedly thickened, œdematous, and friable. A posterior gastrojejunostomy was established, with local drainage. The patient died at 1 P.M., July 4.

Autopsy No. 2371. Plastic peritonitis over upper abdomen. Gastro-enterostomy. Pyloric ulcer. The submucosa of entire pyloric end of stomach infiltrated with purulent exudate. Several abscesses surrounding ulcer.

Cultures showed streptococci.

CASE III.—*Phlegmonous Gastritis; Pyloric Ulcer; Healed Duodenal Ulcer.*—Jacob K., forty-eight years, admitted to Mount Sinai Hospital (service of Dr. A. A. Brill), July 19, 1915. Previous history was negative. Present illness began six days before admission when transient frontal headache developed. Two days later, headache recurred, and there was sudden onset of severe epigastric pain, with an attack of vomiting. Pain continued. The patient vomited three times two nights ago. There had been no bowel movement. The night before admission the stomach tube was passed, but there was no return.

Physical examination on admission showed a moribund man, with signs of pulmonary œdema and peritonitis. The temperature was 103.6. The patient died three hours after admission.

Autopsy No. 2544. Sanguino-purulent fluid in peritoneum, containing streptococci. Phlegmonous gastritis of entire stomach, involving all walls, especially the submucosa and mucosa. Old ulcer at pylorus; healed ulcer of duodenum.

CASE IV.—(Same as Case No. 14 of summary.)—*Phlegmonous Gastritis.*—Nathan P., sixty-five years, admitted to Mount Sinai Hospital (service of Dr. A. V. Moschcowitz), May 14, 1917, at 11.30 P.M. Previous history negative.

TABLE II.

Summary of 48 Cases of Phlegmonous Gastritis Collected Since Sundberg's Series of 215 in 1919.

Case No.	Sex	Age	Occupation	Duration of illness previous to adm.	History and pre-operative diagnosis	Operative procedure and findings	Result	Autopsy or pathological findings	Bacteriology	Author
1	M	51		3 days	Epigastric pain, vomiting, fever. Profoundly ill. 1 yr. before had abdominal pain, vomiting, tarry stool, lasting 1 week		Death, 1 day	Cirrhosis of liver associated with diffuse phlegmonous gastritis	Hæmolytic streptococci	Anderson.
2	M	50		2 weeks, gastric distress	Diagnosis: Carcinomatous pyloric stenosis	Resection	Death, 4th day post-op.	Bilateral pneumonia. No peritonitis. Resected specimen showed carcinoma and circumscribed phlegmonous gastritis		Bardy.
3	F		Servant	2 days	Acute abdominal symptoms, increasing severity. Diagnosis: acute appendicitis, acute pancreatitis, or perforated gastric ulcer	Billroth II resection of ¾ of stomach. Uneventful convalescence except for light grippe pneumonia during 2d week	Death 1 mo. later from ruptured splenic varix	Œdema of gastric wall. Ruptured varix of splenic vein. Exsanguination from abdominal hemorrhage. Resected part of stomach—œdema, causing thickening of 8–10 cm.	No bacteria demonstrable	Bircher. (Case No. 2). (Case No. 1 identical with Sundberg's Case No. 36.)
4	F		Servant		Admitted to hospital moribund. Staphylococcemia sepsis; osteomyelitis of tibia		Death	Osteomyelitis of tibia; staphylococcemia; abscess of stom. wall; purulent thrombosis of cœliac artery	Staphylococci	Bircher Case No. 3.
5	F		Peasant	Several yrs. intermittent gastric distress after heavy labor in fields 1 mo. aggravated symptoms.	Emaciated woman with palpable rt. kidney and abdom. mass size of hen's egg near umbilicus. Free HCl 24. Total HCl 52. Pyloric stenosis in X-ray picture	Ulcer on greater curvature with area of infiltration 5–6 cm. in diam.; intramuscular tumor at pylorus. Billroth I resection, 9–10 cm. wide	Recovery	Specimen resected: infiltrated lymph-node; leiomyoma; peptic ulcer, suppurative gastritis	Not stated	Bircher Case No. 4.
6	M	Not given. Born in 1864		1 mo. gastric disturbances	Stomach dilated; left ing. hernia. Free HCl 57. Total HCl 95. Pyloric stenosis in X-ray picture	Entire pyloric region infiltrated injected and œdematous; lymph-nodes enlarged. Pylorectomy	Recovery	Specimen resected: suppurative gastritis	Not stated	Bircher Case No. 5.

7	F	34		7 days previous tonsillitis for 2 days	1st day in hospital some epigastric pain; 3rd day severe pain, vomiting, fever, continued till 5th day. Diagnosis; acute cholecystitis. Operation	Gastrostomy. Phlegmonous gastritis of pylorus, 2 inches broad	Operative recovcovery. 12th day saphenous phlebitis. 15th day sharp pain in left chest, then gradual improvement till 28th day, when fatal pulmonary embolism	No autopsy	Cultures taken but not reported	Brooks and Clinton.
8	M	50	Laborer	6 weeks	Pain and nausea ½ hr. after meals. Loss of weight. X-ray showed moderate pyloric stenosis. 1 day transient fever. Operation following day. Diagnosis: Carcinoma of pylorus	Subtotal gastrectomy. Carcinoma of pylorus. Billroth II (Polya-Reichel)	Death 1 day post-op.	Specimen of resected stomach shows carcinoma of pylorus with phlegmonous gastritis surrounding it. Autopsy: no metastatic deposits. Streptococci in heart blood	Hæmolytic streptococci	Bumm, R.
9	M	52	Laborer	40 days	Apparently adm. shortly before death		Death	Carcinoma of cardia, with localized phlegmonous gastritis. Sepsis		Businco (autopsy report).
10	F	50			Erysipelas following operation on lachrymal sac, 7 days prev. Convalescing until few days before death. Rise in temp. malaise shortly before death, repeated vomiting, pus in vomitus		Death 22 days after operation	No autopsy	Streptococci	Cange and Micheleau.
11	M	50			Epigastric pain and vomiting. No fever, rigidity or distention		Death less than 48 hrs. from onset	Phlegmonous gastritis of entire organ; no peritonitis	Streptococci	Eurich and Phillips.
12	M	58	Laborer		Sudden onset 11 days after oper. for double inguinal hernia. Symptoms of upper abdominal peritonitis	Laparotomy drained around stomach and to pelvis. Phlegmonous gastritis and peritonitis	Death 8 hours after operation; 4 days after onset of symptoms	Phlegmonous gastritis	Streptococci	Fink.
13	F	22					Death from puerperal sepsis	Phlegmonous gastritis, part of a general sepsis		Fahmy.
14	M	65		2 days	Diffuse peritonitis following perforated gastric ulcer	Laparotomy and drainage for phlegmonous gastritis and purulent peritonitis.	Death 24 hrs. after operation	Pyloric, ⅔ds of stomach involved. No ulcer; peritonitis	Pneumococci	Gerster (See text Case IV).
15	M	20		8 mos.	Epigastric tumor	Circumscribed phlegmonous gastritis. Pylorectomy	Operative recovery. Death 4 wks. later from secondary perforation of stom.	Not obtained. Resected specimen showed phlegmonous gastritis		Guibal.

TABLE II.—*Continued.*

Summary of 48 Cases of Phlegmonous Gastritis Collected Since Sundberg's Series of 215 in 1919.

Case No.	Sex	Age	Occupation	Duration of illness previous to adm.	History and pre-operative diagnosis	Operative procedure and findings	Result	Autopsy or pathological findings	Bacteriology	Author
16	M	43			Alcoholic. Epigastric pain, vomiting, diarrhœa, moderate fever		Death in 2 days	Phlegmon of entire stomach No ulcer		Hickel, P.
17	M	37		Acute illness, brief duration		Abscess of stomach wall in pyloric region, drained	Death on 3d day	Phlegmonous gastritis. Peritonitis		Kister.
18	M	55	Metal polisher	12 wks. dull abdominal pain	Free HCl O. 4th day slight jaundice, gradually declined. Few days before death, Deininger's symptom noted		Death 49 days after adm.	Diffuse phlegmonous gastritis associated with cholelithiasis	Streptococci	Lawrence, J. S. (Case No. 1.)
19	M	52	Laborer	3 mos. gastric disturbances	Gastric analysis normal except for stasis. Pre-operative diagnosis: Gastric carcinoma	Ulcer of lesser curvature. Billroth II. Pt. did well for 4 days; then worse	Death 7 days after operation	*Post-operative phlegmonous gastritis*; diffuse peritonitis	Streptococci	(Case No. 2.)
20	M	63	Laborer	6 days sore throat	Chill, incessant vomiting, epigastric pain, fever, peritonitis	Laparotomy. Stomach covered with fibrin. Drainage	Death in 24 hrs.	Phlegmonous gastritis; ⅔ds stomach involved; wall 1 inch thick. Fibrinous peritonitis	Streptococci in stained sections	Lehnhoff.
21	M	17			Suddenly ill a few hours after eating pork. Collapse. Epigastric pain, vomiting		Death 38 hrs. from onset	Typical phlegmonous gastritis; no lesion of mucosa		Moynihan.
22	F	60		1 day	Sudden onset intense abdominal pain and vomiting. Diagnosis lay between perforated ulcer, pancreatitis, and acute cholecystitis	Diffuse phlegmon of entire stomach. *No peritonitis*	Death 4th day from onset of symptoms	Diffus phlegmonous gastritis; diffuse peritonitis	Streptococcis brevis	MacAuley.
23	F	19		3 yrs. gastric disturbances worse last 6 mos.; sudden onset, 2 days	Diagnosis: cholecystitis. Operation 7 days after acute onset	Resection. Billroth II. Balfour-Polya	Recovery	Large submucous abscess of pyloric region; overlying mucosa intact	No report	Novak.

24	M	29		4 yrs. gastric symptoms	1919, gastro-enterostomy for duodenal ulcer; 1921, jejunostomy for gastrojejunal ulcer with dense adhesions 1922, subtotal gastric resection for gastrojejunal ulcer	Billroth II	Death on 5th day	*Post-operative phlegmonous gastritis* around anastomosis in submucosa; peritonitis (Eiselsberg clinic)		Orator, V. Case No. 1.
25	F	45		9 mos.	Pain, vomiting, marked loss of weight; palpable tumor. Free HCl.O. Total acid, 26 X-ray showed defect in antrum. Pre-op. diagnosis: tumor?	Billroth II for ulcer of of lesser curvature, nearer pylorus than cardia	Death not stated but is cited as 2d case of post-op. phlegmonous gastritis	Resected specimen showed diphtheritic ulcer and phlegmonous gastritis involving all layers. (Eiselsberg clinic)		Case No. 2.
26	M	25		3 weeks prodromal symptoms 1 day acute symptoms	Sudden onset of epigastric pain while lifting a heavy object. Adm. with typical symptoms of perforated gastric ulcer. X-ray showed air under both sides of diaphragm	Free air in peritoneal cavity. Phlegmon of anterior surface of body of stomach, with perforation at centre. Billroth II subtotal resection	Marked post-op. acidosis controlled by glucose and insulin. Recovery	Resected specimen: small perforated callous ulcer on greater curvature; 19 cm. from pylorus; area of phlegmonous gastritis, size of a saucer around ulcer		Case No. 3.
27	M	40				Billroth I for duodenal ulcer	Death on 5th day from gastric retention	Suture line intact. Stomach dilated. No peritonitis. Microscopically, *phlegmonous gastritis around anastomosis*		Case No. 4.
28	F	60		Long history of indigestion	Diagnosis on adm. Acute perforated gastric ulcer	Anterior gastro-enterostomy. Abdomen drained. Phlegmonous gastritis	Death less than 24 h post-op.	Phlegmonous gastritis	No cultures made	Owen, D. R. Case No 1. (Autopsy report).
29	M				Diagnosis: acute perforated gastric ulcer. Profound prostration	Phlegmonous gastritis; diffuse peritonitis. Drainage rectovesical pouch. Diagnosed as phlegmonous gastritis at operation	Death shortly after operation	Phlegmonous gastritis	Streptococci and colon bacilli	Case No. 2 (Autopsy report).
30	M		Soldier			No operation	Death	Bronchopneumonia. Diffuse phlegmonous gastritis (infection of corrosive lesions caused by poison gas)		Pech Case No. 1.
31	M	39	Soldier		In hospital 1 mo., when sudden onset	No operation	Death	Pyloric carcinoma with associated circumscribed phlegmonous gastritis		Case No. 2.
32	F	56		Long history of indigestion	11 days of increased epigastric pain, fever, leucocytosis	Stomach acutely infected and thickened in pyloric half, especially post. wall. Stomach opened. Large ulcer of post. wall Billroth I. Duodenum very long	Death 17 days post-op. Sloughing. Secondary hemorrhage	Resected specimen showed ulcerated carcinoma; suppurative gastritis. Apparently no autopsy		Rixford, E. Case No. 1.

TABLE II.—*Continued.*

Summary of 48 Cases of Phlegmonous Gastritis Collected Since Sundberg's Series of 215 in 1919.

Case No.	Sex	Age	Occupation	Duration of illness previous to adm.	History and pre-operative diagnosis	Operative procedure and findings	Result	Autopsy or pathological findings	Bacteriology	Author
33	M	54			Alcoholic 1 mo. gastric symptoms; worse for past week; much worse past 2 days. Diagnosis: acute gastric ulcer with peritonitis	Indurated inflamed area, 6 cm. in diam. Aspiration of this area revealed pus. Billroth II. resection of pyloric half of stomach	Death 4 hours. post-op.	Phlegmonous gastritis	Streptococci	Case No. 2.
34	F	40	Domestic	Sore throat and cold for 6 days	At noon sudden epigastric pain, etc. Diagnosis lay between basal pneumonia, acute pancreatitis, gastric phlegmon	Entire stomach involved, thickened red, inert. Multiple drains	Death 24 hrs. post-op.	Phlegmonous gastritis; mucosa intact.	Streptococci	Case No. 3.
35	F	57		2 days	Epigastric pain, fever, vomiting, prostration, Diagnosis: perforated ulcer	Billroth II resection	Death 2 days after onset	Carcinoma associated with phlegmonous gastritis	Streptococci	Sandelin, Case No. 1.
36	F	44		1 day	Peritonitis of unknown origin		Death 3 days after onset	Phlegmonous gastritis	Streptococci	Case No. 2.
37	F	44		5 days	"Fatal peritonitis of	short duration—"		Autopsy demonstration. Pyloric region mainly involved by typical phlegmonous gastritis	Streptococci	Schoo.
38	M	39		7 days	Far-gone peritonitis	No operation	Death	Phlegmonous gastritis	Streptococci	Secchi.
39	M	29	Colored laborer	1 day	1 mo. vague abdominal pains. Diagnosis: perforated gastric ulcer	Laparotomy with drainage, gastrostomy, stomach red, thick, and boggy	Death 28 hrs. after operation	Peritonitis; phlegmonous gastritis; many minute perforations	Streptococci	Shatara.
40	F	48		Gastric symptoms for some time. 2 days, epigastric pain and fever	Pre-op. diagnosis: infected pancreatic cyst	Pain subsided, hard epigastric mass felt as abdominal rigidity decreased. Operation on 9th day. Phlegmonous gastritis with inflammatory thickening of omentum, transverse colon, mesocolon, and gastrocolic ligament	Recovery. 5 yrs. later entirely well. Free HCl = 0. X-ray showed hourglass contracon on lesser curvature, one finger's breadth wide	Aspirated pus from stomach wall showed streptococcus and B. subtilis		V. Stapelmohr.

41	F	40	Of laboring class	8 days dysphagia, 2 days ago sudden onset	Epigastric pain, repeated vomiting; vomitus bloody; fever. Diagnosis: peritonitis	*Emergency operation.* Phlegmonous gastritis and peritonitis, tamponade	Death 9 hrs. post-op.	Phlegmons of œsophagus, stomach, pyloric half; diffuse purulent peritonitis		Stöhr, Case No. 1.
42	F	74	Of laboring class (insane)	3 days	2 days after adm. sudden onset of peritonitis	Diffuse peritonitis. Phlegmonous gastritis. Billroth II resection of pyloric ⅔ds	Death 2 days post-op.	Peritonitis. Suture lines intact. Resected specimen showed phlegmonous gastritis; in pyloric end at center of maximal induration was a needle penetrating stomach wall	Streptococci	Case No. 2.
43	M	51	Sailor	2 days	Alcoholic. Acute onset epigastric pain, tenderness, and vomiting. Diagnosis: ulcer or pancreatitis	Gastrostomy; condition recognized at operation	Death 3d day post-op.	Phlegmonous gastritis of pyloric region; peritonitis	Streptococci	Westbrook.
44	M	34		6 days	Gastric disturbance as child and again of late. Sudden onset epigastric pain, nausea, no vomiting. Phys. exam. negative, except for epigastric rigidity and tenderness. No fever. Pulse 64. Diagnosis: slowly perforating gastric ulcer	Immediate operation, small abscess surrounded by inflamed omentum. Tumor on greater curvature, size of small apple. Billroth II Krönlein-Mikulicz resection with drainage	Recovery	Resected specimen: tumor projected into gastric lumen like a hemisphere covered by intact mucous membrane. On section, showed necrotic tissue infiltrated with hemorrhages	Hæmolytic streptococci	Zoepffel.
45	M	52	Carpenter	5 days	Erysipelas 5 weeks *before admission.* Moribund	No operation	Death 2 hrs. after adm.	Entire stomach involved by phlegmon. Small ulcer at greater curvature, 5 cm. from pylorus. Serous peritonitis	Streptococci	See text, Case I.
46	F	27		6 days	Headache, chills, vomiting, no pain in abdomen. 4 days after adm. transferred to surgical side	Operation (Dr. A. V. M.) phlegmonous gastritis of pyloric half of stomach. Gastro-enterostomy	Death 20 hrs. after operation	Phlegmonous gastritis; pyloric ulcer; abscess of gastric wall near ulcer	Streptococci	See text, Case II.
47	M	48		6 days	Frontal headache. 4 days ago, epigastric pain; some vomiting; fever. Moribund on adm., signs of pulmonary œdema and peritonitis		Death 3 hrs. after adm.	Phlegmonous gastritis of entire stomach old ulcer at pylorus; healed duodenal ulcer	Streptococci	See text, Case III. 3.
48	F	40		2 days	Chills, fever, vomiting, epigastric pain. Provisional diagnosis; pancreatitis. Abdominal puncture showed streptococci. Pancreatitis excluded (Neuhof)		Death 2 days after adm.	Phlegmonous gastritis of entire stomach involving beginning of duodenum. No ulcer	Streptococci	See text, Case V. 5.

Present illness began two days before admission when the patient suffered from diffuse abdominal cramps, localized more to the right half of the abdomen. He had vomited several times; there had been no bowel movement for the past two days.

Physical examination on admission showed an old man, acutely ill. The abdomen was tense and rigid, the tenderness being most marked in the upper abdomen. Rebound tenderness throughout. Pre-operative diagnosis was diffuse peritonitis, probably appendicitis or perforated gastric ulcer.

At operation (the author) on May 15, at 12.50 A.M., revealed a diffuse purulent peritonitis with a sparse amount of greenish purulent exudate in all parts of the abdominal cavity. The pyloric portion of the stomach was markedly injected and thickened, in contrast to the duodenum and upper part of the body of the stomach. There were flakes of fibrin along the lesser curvature. All lymph-nodes in the abdomen were enlarged. No fat necrosis was present. The rest of the abdominal organs—gall-bladder, appendix, large intestine, etc.—were negative. The pancreas was inspected through unchanged lesser omentum. Drainage was instituted, and the wound closed. Diagnosis: Phlegmonous gastritis with general peritonitis. The patient did not react well, and died twenty-four hours later.

Cultures showed pneumococcus.

Autopsy No. 2891. Acute phlegmonous gastritis. Fibrino-purulent peritonitis. Pyloric two-thirds of stomach involved; wall 2 cm. thick, due to swelling of mucosa and submucosa. In antrum there were two large necrotic patches of mucosa, 3 to 4 cm. square. No ulcers. Duodenum and œsophagus normal.

Microscopical examination: Throughout entire wall of greatly thickened stomach there was tremendous œdema and purulent infiltration. Great number of veins filled with blood-platelet thrombi. Gram-Weigert stain showed cocci throughout section, mainly lanceolate in shape.

CASE V.—*Phlegmonous Gastritis.*—Susie J., obese negress, forty years, admitted to mount Sinai Hospital (service of Dr. C. A. Elsberg), February 11, 1923, with history of generalized abdominal pain, vomiting, fever of 104, and chills for the past two days. No antecedent history.

Physical examination on admission showed general abdominal rigidity and tenderness; no masses; no fluid wave. The provisional diagnosis of acute pancreatitis (Dr. H. Neuhof) was made. At 10 P.M. the same day the blood count was: White cells, 9000; polymorphonuclears, 78 per cent. The next day the patient was delirious and the high fever persisted. Abdominal puncture (Dr. Ira Cohen) yielded sero-purulent fluid, in which hæmolytic streptococci were found. The patient died at 1.45 P.M.

Autopsy No. 4191. Phlegmonous gastritis involving the stomach wall from the cardia to the pylorus and the first few centimetres of the duodenum was found, the process being most marked in the antrum. Localized perigastric abscess. No ulcers. Luetic aortitis.

TABLE I.

Surgical Summary of 263 Cases.

	Recoveries	Deaths
Exploratory laparotomy with drainage	2	23
Gastrostomy	0	4
Gastro-enterostomy	2	2
Jejunostomy	0	1
Resections	8	10
Drainage of abscess	1	1
Post-operative phlegmonous gastritis	0	5

CONCLUSIONS

1. Phlegmonous gastritis is a rare condition, the varieties and pathogenesis of which are becoming more clearly recognized as material accumulates.

2. It may be assumed that there are:

a. Mild cases in which recovery may occur without the condition being recognized;

b. Fulminant types, ending in death within a few hours;

c. Acute cases, running a course to two or three weeks, usually with a fatal outcome, but occasionally undergoing spontaneous recovery with more or less protracted convalescence;[6]

d. Subacute, chronic forms which may simulate neoplasms, the less extensive types of which may lead to cicatricial changes in the gastric wall, depending on their extent and location.

3. Cures reported following palliative surgery, such as local drainage or gastro-enterostomy, may properly be considered as spontaneous recoveries.

4. Resection is the operation of choice when feasible. It gives a higher mortality in recent cases than in those which have lasted for some time before reaching the surgeon.

5. Post-operative phlegmonous gastritis is probably of more frequent occurrence than is realized, and hence it is advisable to make microscopical examinations of tissues from the region of anastomoses in all cases coming to autopsy.

BIBLIOGRAPHY

Ackermann: (1869.) Virchow's Arch., vol. xlv, p. 39.
Anderson: (1922.) Canadian Med. Jour., vol. xii, p. 492.
Bardy: (1910.) Finska Läkarsallsk. Handl., p. 579.
Bircher: (1924.) Deutsch. Ztschr. f. Chir., vol. clxxxvi, p. 409.
Brooks and Clinton: (1922.) J. Michigan Med. Soc., vol. xxi, p. 193.
Bumm, R.: (1925.) Deutsch. med. Wchnschr., vol. li, p. 434.
Businco: (1923.) Riforma med., vol. xxxix, p. 577.
Cange and Micheleau: (1921.) Paris méd., July 16, p. 64.
Cruveilhier: (1862.) Traité d'anat. path. générale, Paris, T. iv, p. 485.
Eurich and Phillips: (1921.) Lancet, vol. i, p. 910.
Fahmy, T.: (1921.) Thèses de Lausanne.
Fink: (1916.) Boston Med. and Surg. J., vol. clxxv, p. 795.
Galen: See Sundbergs Extensive Historical Review.
Gerster: (1919.) Med. Record, New York, vol. xcv, p. 502.
Guibal, P.: (1925.) Bull. et mém. soc. nat. de chir., vol. li, p. 468.
Hickel, P.: (1922.) Bull. et mém. soc. anat. de Paris, No. 19, p. 257.
Kister: (1925.) Rev. from Russian, cf. Zntralbl. f. Chir., 1925, p. 1401.
Lawrence, J. S.: (1926.) Boston Med. and Surg. J., vol. cxcv, p. 800.
Lehnhoff: (1917.) J. Amer. Med. Assn., vol. lxviii, p. 966.
Moynihan: (1922.) British J. of Surg., vol. x, p. 40.
MacAuley: (1922.) British J. of Surg., vol. x, p. 40.
Novak: (1919.) J. Amer. Med. Assn., vol. lxxiii, p. 1038.
Orator, V.: (1926.) Arch. f. klin. Chir., vol. cxl, p. 378.

[6] The abscess cases fall in this group.

Owen, D. R.: (1926.) Lancet, vol. i, p. 865. British Med. J., vol. i, p. 787.
Pech, H.: (1922.) Thèses de Paris, 1923.
Rixford, E.: (1917.) Trans. Amer. Surg. Assn., vol. xxxv, p. 472.
Sandelin: (1922.) Finska Läkarsallsk. Handl., p. 64.
Schoo: (1918.) Nederl. Tijdschr. v. Geneesk., vol. lxii, No. 1, p. 1600.
Secchi, R.: (1919.) Riforma med., vol. xxxv, p. 569.
Shatara: (1918.) J. Amer. Med. Assn., vol. lxxi, p. 2130.
V. Stapelmohr: (1925.) Wien. klin. Wchnschr., vol. xxxviii, p. 1010.
Stieda: (1900.) Deutsch. Ztschr. f. Chir., vol. lvi, p. 212.
Stöhr: (1926.) Wiener. klin. Woch., vol. xxxix, p. 525.
Sundberg, H.: (1919.) Nord. med. Archiv., vol. li, p. 303.
Westbrook, R. W.: (1916.) Long Island Med. Jour., vol. x, p. 525.
Zoepffel: (1923.) Deutsche Zeitschr. f. Chir., vol. clxxxii, p. 158.