PERFORATION OF PEPTIC ULCER*

OBSERVATION OF ONE HUNDRED CASES AT THE PENNSYLVANIA AND PRESBYTERIAN HOSPITALS

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Acute perforation of peptic ulcer has presented a problem of interest to surgeons for many years, and in view of the already voluminous literature on the subject, it is with a feeling somewhat of temerity that we present this paper, especially as we fully appreciate that it contains nothing new.

With the thought that it might be of interest to review those treated at the Pennsylvania and Presbyterian hospitals in recent years, we have examined the records of sixty-six cases at the former, from 1910 to 1928; and thirty-four at the latter, from 1920 to 1928, each having been operated upon and the diagnosis of perforation confirmed.

During this period there were admitted to the Pennsylvania Hospital 637 cases, and to the Presbyterian Hospital 243, a total of 880, in which the diagnosis of peptic ulcer was made.

For the privilege of reporting this series I am indebted to Doctors Gibbon and Mitchell, at the Pennsylvania; and Doctors Jopson, Hodge and Speese, at the Presbyterian; and the former chiefs at both institutions, upon whose services the cases were admitted.

Operation for perforation usually requiring emergency treatment, the vast majority were performed by the members of the junior staffs who handle such cases. This fact should be borne in mind in discussing the operative procedure adopted. The results are, therefore, fairly representative of what may be expected in two such general hospitals.

Two patients were under twenty years of age (Table I), twenty-six were

Table I

Table Showing Age of Patients

Under 20	20–29	30–39	40–49	50–59	Over 60	Not stated
2	26	27	17	17	7	4

between twenty and thirty, twenty-seven between thirty and forty, from which time the incidence decreased, seven being over sixty years of age.

We were rather surprised at the preponderance of the condition in males, it having occurred only five times in women. This is in accord with other observers, the proportion of males, however, being somewhat higher than in many of the recorded series.

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Just why the colored race should have a considerably lower percentage of perforation is not clear, only ten cases having been encountered.

A discussion of the etiology of peptic ulcers and their perforations would lead one far afield and is not within the scope of this paper, nor is it our intention to dwell, except very briefly, on the question of symptomatology and differential diagnosis. Those interested in these aspects of the subject are referred to the many excellent articles dealing therewith. Sufficient to say that abdominal pain, either upper or generalized, with or without vomiting, was recorded as the chief complaint ninety-five times, and one patient had symptoms confined to the region of the left kidney. Six gave a history of hæmatemesis, two had melina, and two noted both symptoms in addition to the abdominal pain.

About one-half of the entire group had been for various periods under more or less irregular medical observation for "stomach trouble", and of these, only eight had regarded themselves as being improved, and none, as cured of their complaint.

In making a differential diagnosis, among the conditions most frequently encountered, one must consider the possibility of acute appendicitis; acute cholecystitis (with or without stone); acute pancreatitis; thoracic infections; mesenteric embolus; tabetic crises; volvulus; intestinal obstruction, and other less frequently encountered conditions. A mistaken diagnosis of acute appendicitis was made seven times; acute cholecystitis five times; intestinal obstruction in three, and acute pancreatitis in two instances.

The fact that all cases of acute perforation do not present acute symptoms was exemplified by a colored man, of thirty-five years, who was admitted to the Pennsylvania Hospital complaining of moderate abdominal pain. He had been having occasional attacks of indigestion for the preceding four years, and on the day of admission had a rather severe exacerbation of his previous symptoms. On admission he showed a pulse rate of eighty-four and sub-normal temperature, lay quietly in bed, was not shocked, and while there was some upper abdominal tenderness, there was no marked rigidity. He was seen by one of the junior members of the staff and held for observation. Next day the tenderness had increased somewhat, there was moderate abdominal rigidity, peristalsis was audible but sluggish, and the liver dulness was not obliterated. Exploration was advised on the strength of his history and physical signs and revealed a perforated callous duodenal ulcer, with widespread fluid in his abdomen. A simple closure and drainage was done and he made an uninterrupted recovery.

In this connection it was noted that on admission (Table II) sixty-four patients were in a condition of shock and presented a rigid abdomen; twenty-two had rigidity without shock; two were in a condition of shock but had no rigidity, and in five the notes state that they presented neither shock nor rigidity.

A colored man of thirty-five years was treated in the medical wards and discharged at the end of twenty-eight days, the diagnosis being abdominal

angina. He was readmitted three weeks later with symptoms of a perforation and immediate exploration revealed a perforation of a callous gastric ulcer with his abdomen full of gastric contents. He died.

TABLE II
Table Showing Condition of Patients on Admission

Shock and rigid	Not shock—rigid	Shock—not rigid	Not shock—not rigid	Not stated
64	22	2	5	7

These observations merely stress the importance of being on the lookout for cases presenting atypical symptoms.

In 79 per cent. of the cases, the pre-operative diagnosis of perforated ulcer was correct, but this of course does not take into consideration those instances where exploration revealed such a pre-operative diagnosis to have been wrong. This percentage is lower than that reported by Brenner [1]—91 per cent. correct diagnosis in twenty-four acute cases. We believe, however, that the important factor is the recognition of the fact that the patient has an acute abdomen requiring immediate exploration, and that one should not delay operation in an endeavor to make a correct diagnosis.

Very little need be said about the importance of early surgery in cases of acute perforation. In this series, of fifty-four cases seen within twelve hours, fourteen died (Table III), a mortality of 28 per cent., 27 per cent. in Stenbuck's [2] series of fifty-three. Fourteen patients were operated upon between twelve and twenty-four hours, eight of whom died, a mortality of 57 per cent. One patient with a history of perforation six days previous to operation, and another of seven days' duration, each lived, exploration revealing a partially walled off localization of the perforation.

In thirteen instances the patients gave a definite history of prodromal symptoms previous to perforation, as evidence by a marked increase of their former trouble. Eight of these cases died. Table III shows the duration of chronic symptoms, and it is of interest to note that in ten instances the patients were sure that they had been free of symptoms previous to the time of their perforation. Four patients had previously had an appendectomy and two had been operated upon for peptic ulcer, one of the latter being a perforation.

Anæsthesia.—Nitrous oxide-oxygen, usually with sufficient ether for relaxation, was the anæsthetic of choice in the vast majority of instances. It is our personal feeling that in these cases, this combination, when properly administered, more nearly approaches the ideal than any other method. Many of the operations, starting as local, end with a general anæsthetic, and we feel that the time spent in administration of local measures is therefore largely wasted. Frequently these patients are poor surgical risks and operative speed is a prime requisite. Muscular relaxation being one of the important factors

TABLE III

Table Showing Duration of Acute and Chronic Symptoms before Operation, with Outcome

Duration of acute symptoms before operation		Chronic symptoms																						
			Weeks				Months										Years							
		None	1	2	3	4	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	Over 5	Not stated	Total
Under 12 hrs.	L.*	7	5	1	1	1	2	1			2		1				2	3	4	5	2	10	4	51
	D.†	2	1		2												2	1	1			4	1	14
12 to 24	L.			1									1					1		1		1	1	6
	D.			1					1									1	3	1		1		8
24 to 36	L.																					1		1
	D.						1				1									1		1		4
36 to 48	L.		1										1										1	3
	D.	1																				1		2
2½ Days	L.																							
	D.	1																						1
3 Days	L.												1											1
	D.																							
4 Days	L.				1												1							2
	D.																							
5 Days	L.																						1	1
	D.																							
6 Days	L.																	1						1
	D.																							
7 Days	L.		1																					1
	D.																							
Over	L.																							
	D.				1																			1

* L.—Lived.

† D.—Died.

in this connection, it has been our experience that this can be most satisfactorily obtained by the use of nitrous oxide-oxygen.

The chief objection to a general anæsthetic is of course pulmonary complications. Six patients developed pneumonia and died.

We fully realize that many surgeons condemn any form of general narcosis in these cases, and if they or their assistants are adept in the use of para-vertebral, intraspinal or other methods of administration, they have all the more reason for favoring their use. It has, however, been our experience in general major abdominal operations, using one or a combination of the various forms of local anæsthesia, that pulmonary complications are by no means avoided. We feel, therefore, that unless one has had extensive experience in the use of local methods, it is usually better for both surgeon and patient to use a general anæsthetic when dealing with acute peptic perforations.

We are in accord with the majority of surgeons who have written on the subject that the diagnosis of perforation is an indication for immediate operation regardless of the patient's condition. Four cases, however, not included in this series, with histories and signs typical of perforation, were so near death on admission that it was evident operation *per se* would be fatal. With the exception of these fatalities, all other cases were explored soon after the diagnosis of perforation was made.

Operative Procedure.—One of the moot points which will probably never receive unanimous support, is whether operative measures should be limited to merely closing the perforation, with or without excision of the ulcer, or whether a gastro-enterostomy should be added, there being very few writers as yet who advocate a partial gastrectomy at this stage.

Should one be fortunate enough to explore a duodenal or pyloric ulcer within a few hours preceding its perforation, the patient being in good condition, we believe that few surgeons would be content with merely local treatment of the ulcer. From their recorded observations most operators prefer, in addition to some form of excision, cautery puncture or simple invagination, a gastro-enterostomy, pyloroplasty or other procedure. It therefore seems illogical to us that the mere fact of the ulcer having perforated should so change the underlying pathology as to render unnecessary any measure other than simple excision or closure, providing, of course, that the patient's condition is such as to warrant a gastro-enterostomy or pyloroplasty being done.

A colored man of twenty-eight years, who stated that he had always suffered from indigestion, was operated upon five years previously for a perforated appendix. Two years later he had a simple closure done for a perforated duodenal ulcer, and he had relief for the next three years till the day of admission. At this time he made his own diagnosis of perforation, and exploration revealed a partially walled off perforation in the centre of an old duodenal ulcer. The ulcer was closed and a posterior gastro-enterostomy was done. On the nineteenth post-operative day pus was aspirated from the

eighth costal interspace posterior axillary line; his abdominal condition apparently cleared up but he gradually sank and died on the twenty-fifth post-operative day.

A comparison of the mortality of those cases in which gastro-enterostomy was not done (seventy-two cases with twenty-five deaths—39 per cent.) with those in which this method was adopted (twenty-eight cases with eight deaths—29 per cent.) is of little value, for it fails to take into consideration the condition of the patient at the time of operation. In the latter group, in which gastro-enterostomy was done, pneumonia and myocarditis were each responsible for one fatality and peritonitis for the remainder. The extra time required for adding the gastro-enterostomy apparently did not influence the outcome (Table IV), and we feel that this argument cannot be used against its adoption.

TABLE IV

*Table Showing Duration and Type of Operation with Outcome**

	Minutes								Hours							
	20		30		45		60		1¼		1½		1¾		Over	
	L.†	D.‡	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.
Simple closure	5	5	14	9	12	7	6	3	4			2	1			
Closure plus gastro-enterostomy					2	1	2	1	9	2	2	1	4		1	

* 7 cases not stated as to time.
† L.—Lived.
‡ D.—Died.

Judging from the follow-up records of other writers, excellent results have been obtained when the simpler method was used, and we regret exceedingly that the follow-up systems at the Pennsylvania and Presbyterian hospitals did not enable us to reach a sufficient number of these patients to make their recording worth while. We realize that this omission in itself greatly vitiates the value of our observations, but, in spite of this failure, we are of the opinion that if the patient's condition warrants it, and the technical difficulties are not a contraindication, closure of the perforation, or excision and closure, plus posterior gastro-enterostomy is the method of choice.

When it can be done we feel that the appendix should be removed coincident with the treatment of the perforation, and this seems all the more important when it is so situated, from adhesions or otherwise, that its removal adds somewhat to the technical difficulties.

Drainage.—Where it was noted that the perforation was either walled off from the general peritoneal cavity, or the latter was not grossly contaminated —twenty cases—drainage was omitted seven times with two deaths, each from peritonitis. In those cases, eighty in number, in which the peritoneum was widely involved, after removing as much as possible of the contaminat-

ing material, the abdomen was closed without drainage eight times. Two in this group of eight died.

While it may not always be necessary to institute drainage following a perforation, depending upon the extent and type of involvement of the peritoneal cavity, yet we have never seen any ill result which could be attributed to its use. We prefer a cigarette drain placed in the pelvis, through a separate stab wound in the lower abdomen, and should peritonitis not occur it can be removed at the end of forty-eight hours. The recollection of a few instances is still quite vivid in which drainage was not considered necessary but was done, and subsequent developments made us very thankful that this procedure had been adopted. In the great majority of cases the drain was removed on or before the end of the second day, which fact tends in itself to prove that it was not necessary.

Complications.—Peritonitis, either local or widespread, was, of course, present to a variable degree in each case but was not recorded as such unless it persisted and gave rise to symptoms beyond the second post-operative day. Twenty-four patients developing this complication died, while eighteen survived. Table V shows how frequently this condition was encountered in the various types of ulcer; whether or not the abdomen was drained; the type of operation done; whether or not the perforation was walled off, and the mortality in each group.

Subphrenic abscess as such, giving rise to symptoms several days after operation, was only encountered once. A white man of fifty-one years, with a twelve-hour perforation of a duodenal ulcer which had been giving rise to symptoms for two weeks previously, had a simple closure and drainage operation done, peritonitis being widespread. On the twenty-second post-operative day laparotomy was again done for intestinal obstruction—small bowel to hepatic colon. On the thirty-third day following the original operation symptoms of intestinal obstruction again developed, and at operation, in attempting to free the adhesions, the small bowel was twice ruptured and closed. On the sixty-fourth post-operative day he developed a subphrenic abscess which was later opened and drained and he made a good recovery. A collection in the subphrenic region may of course have existed in those cases dying of peritonitis, but if so, it was not recognized as such. Whether or not this low incidence of subphrenic abscess was due to the fact that only in very few instances was the upper abdomen drained, as advanced by Mills [3] we do not know.

Two patients developed empyema subsequent to pneumonia. Two patients eviscerated a large part of their intestinal tracts following violent coughing attacks, one of them having a gastric hæmorrhage in addition. We cite these latter cases as a plea for the use of strong catgut in closing the peritoneal cavity, especially when the latter is infected.

There was a mortality of 33 per cent. for the series as a whole (46 per cent. Dunbar,[4] 31 per cent. Stenbuck,[2] 27 per cent. Mills,[3] 18.6 per cent. Gibson [5]).

TABLE V

Table Showing Whether Perforation Was Walled Off from Abdominal Cavity; Type of Operation; Whether Drainage Was Used; Whether Peritonitis Developed and Outcome of Case

Location of Ulcer	Perforation walled off																Perforation not walled off (free)													
	Simple closure								Closure and gastro-enterostomy								Simple closure								Closure and gastro-enterostomy					
	Drain				Not drained				Drain				Not drained				Drain				Not drained				Drain				Not drained		
	‡ Peri't later		Not peri't later		Peri't later		Not peri't later		Peri't later		Not peri't later		Peri't later		Not peri't later		Peri't later		Not Peri't later		Peri't later		Not peri't later		Peri't later		Not peri't later		Peri't later		Not peri't later	
	*L.	†D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	L.	D
Duodenal	1	2	2				1		1		1	1			2		6	3	15			1	2		2	3	3	2			3	
Pyloric		1	1												1		1	3	1	1							3				
Gastric			2	1	1										1	1	5	11	8	2			1		1		2				1
Total	1	3	5	1	1		1		1		1	1			4	1	12	17	24	3		1	3		3	3	8	2			3	1

* L.—Lived
† D.—Died
‡ Peri't—Peritonitis

Table VI shows the interval between operation and death, with causes for the same. The greatest mortality occurred within the first twelve post-operative hours and was ascribed to peritonitis with its associated shock.

TABLE VI

Interval Between Operation and Death, with Cause of Same

	Hours		Days														
	Under 12	12–24	2	3	4	5	6	7	8	9	10	11	12	13	14	Over	Total
Peritonitis			1	2	1	1	1										6
Shock and Peritonitis	8		3														11
Peritonitis and Pneumonia				1	1				1								3
Peritonitis, Pneumonia and Empyema																1	1
Peritonitis and Evisceration													1			1	2
Peritonitis and Alcoholism				1													1
Pneumonia					1	1	1					1					4
Lung abscess															1		1
Post-operative hæmorrhage															1		1
Cardiac—Toxemia							1									2	3

The pulmonary fatalities appeared from the fourth to the sixth day, while the abscess complications were manifest after the second week. This agrees in the main with Stenbuck's observation except that peritonitis falls in an earlier period.

CONCLUSIONS

This series is of course too small to warrant any conclusions of value, and, as was stated at the outset, nothing new has been presented. Our impressions from a study of the group are:

1. Operation should be performed as soon as possible in all cases in which the diagnosis of perforated ulcer has been made, unless the patient is obviously in a moribund condition. Should exploration show that an incorrect diagnosis has been made, the condition revealed will in nearly all cases be one which would have required urgent surgical interference.

2. Nitrous oxide-oxygen is the anæsthetic of choice unless the surgeon has a strong preference for some form of local administration.

3. If the patient's condition warrants it and the operator's technic is proficient, closure, excision or cauterization of the ulcer, plus gastro-enterostomy or pyloroplasty, is the method of choice, this however being an open question.

4. It is safest to institute drainage of the lower abdomen for forty-eight hours in all except definitely walled-off perforations.

REFERENCES

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[3] Mills, G. P.: British M. J., January 3, 1925.
[4] Dunbar, J.: Glasgow M. J., vol. cvi, August, 1926.
[5] Gibson, C. L.: Journal, American Med. Assn., October 6, 1928.