by the absorption of linimentum belladonnae through the unbroken skin after massage. Métivier (1935) also describes how a woman aged 74 developed severe symptoms of poisoning after the instillation of eye drops containing 1% atropine. She became excited, confused, and hallucinated, and the symptoms took some little time to wear off.

A fatal case is described by Taylor (1934) in which a previously healthy woman aged 66 died sixteen hours after taking only 1 drachm of linimentum belladonnae. However, in younger people recovery can occur after much larger doses. One of the largest doses is reported by Grattan (1881), who describes the case of a woman aged 43 who recovered after she had taken a wineglassful of the liniment. The dose was estimated at 18 drachms. The present case is unusual in that a man aged 73 recovered after taking 5 drachms of linimentum belladonnae (the equivalent of 1.2 grains of atropine alkaloid). The dosage was checked by his doctor and his wife: the bottle was full and unopened, there was no evidence of any having been spilt, and the patient had swallowed it at one gulp and was unable to rid himself of any of it. A further unusual feature is that ten hours elapsed before any treatment was begun. No previous record was found of a patient recovering after a large dose of atropine with such delay in treatment, and it must be rare for any patient to pay such little heed to accidental poisoning.

The treatment itself was along orthodox lines according to such authorities as Glaister (1931) and Taylor, with the addition of spinal drainage for the convulsive movements. This procedure seems not to have been previously reported in similar cases. Most benefit appeared to follow the administration of morphine in adequate dosage, although the Edinburgh committee quoted by Taylor concluded that physostigmine had in relation to atropine a wider range of antidotal action than morphine. The rational procedure seems to be a combination of the two—physostigmine as a physiological antidote and morphine as a cortical depressant. Pilocarpine, a time-honoured remedy in atropine poisoning, was not used in this case as there appears to be little evidence that it antagonizes the action of atropine on the brain (Cushny, 1924).

Further unusual features were noted in the symptomatology. Whereas the selective action of atropine on the central nervous system is well known, increased spasticity (resistance to passive movement) in the limbs with an extensor plantar response is not usually described. Presumably these signs are only indicative of the extent and severity of the poisoning. The profuse sweating is unusual, and may be taken as a good prognostic sign. It was probably greater than could be explained by the amount of physostigmine administered, and it is suggested that it represented a release phenomenon occurring as the action of the atropine wore off.

Summary

A case of accidental atropine poisoning in a man aged 73 is described and the unusual features briefly discussed.

Recovery occurred after 5 drachms of linimentum belladonnae (the equivalent of 1.2 grains of atropine alkaloid) had been taken and no treatment given until ten hours afterwards. Certain unusual symptoms are mentioned.

Treatment comprised morphine, physostigmine, and spinal drainage.

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PERFORATED PEPTIC ULCER

A REVIEW OF 175 PERSONAL CASES

BY

J. COSBIE ROSS, Ch.M., F.R.C.S.

Honorary Surgeon to Out-patients, Royal Infirmary Branch of the Royal Liverpool United Hospital

"The perforation of a gastric or duodenal ulcer is one of the most serious and most overwhelming catastrophes that can befall a human being."—MOYNIHAN.

Although this well-worn subject is covered by a vast amount of literature the frequency of the condition and the vital necessity for early recognition and urgent operation justify periodical review and reconsideration. It is doubtful whether any case gives the surgeon as great a feeling of satisfaction as a perforated peptic ulcer successfully dealt with, and certainly no patient is more grateful. There still appears to be a doubt regarding the future prospects of such a case, and relatively recent statistics are conflicting. It is one of the purposes of this paper to discuss the after-histories of 89 cases in which the follow-up was successful.

The present series, consisting of 175 cases, is an entirely personal one, extending over the decade 1930–40. Of these, 7 occurred in women and 168 in male subjects.

TABLE I.—Showing Site of Ulcer

Duodenal ulcer	100
Gastric ulcer	71
Pyloric ring, 33; Pyloric antrum, 6; Anterior wall of body of stomach, 6; Posterior wall of body of stomach, 1; Lesser curvature, 11; Site not particularized, 14.	
Gastro-jejunal ulcer	3
Ulcer of duodenal stump (after gastrectomy some years previously)	1

In 7 cases the perforation was the second which had occurred. I carried out both operations in 2 of these.

Previous History

In reviewing this group of cases it was found that the majority had had some symptoms previous to the acute perforation. Often these symptoms consisted merely of a period of indigestion lasting for a few days or weeks, but many patients had a long-standing history. When such was the case the symptoms for the ten days or fortnight before the perforation were often said to be especially severe. A few patients stoutly adhered to the statement that there had been no previous indigestion whatsoever. In this connexion confusion has probably arisen, as many patients with perforated ulcer are, owing to pain, reluctant to speak, much less to relate details, of previous mild symptoms. For this reason most of the patients in the present series were interrogated regarding the previous history before discharge from hospital. With this precaution few were found who had not had some indigestion before the acute onset. While some cases perforated when a heavy weight was being lifted—a packing-case in one instance, thus raising a medico-legal problem—I was impressed by the fact that several perforations occurred while the patients were in bed and asleep, the severe pain awakening them.

TABLE II.—Total Length of History

No previous symptoms	15
History of several days	5
" " " weeks	10
" " " months	35
" " " years	53

Physical Signs and Diagnosis

The diagnosis is usually easy if it is remembered that board-like rigidity of the abdominal wall depends to a certain extent on the muscular development and usual tonus of that covering. In a female with a lax visceroprotic type of abdominal wall it is dangerous to expect to find a hard board-like rigidity, and it is valuable,

therefore, before palpating the abdomen to consider the general musculature of the patient and thereby to assess the tone of the abdominal wall in health.

Although Hamilton Bailey (1927) states that only 1 case in 10 loses liver dullness, I believe that the proportion is higher, and that it depends largely on the number of hours that have elapsed since the acute onset. When over six hours have elapsed the liver dullness is usually completely lost or is diminished; when completely lost the sign is diagnostic.

The commonest error in diagnosis is in confusing the condition with acute appendicitis associated with generalized peritonitis. In 7 cases of acute appendicitis with generalized peritonitis I made a mid-line incision, mistaking the condition for a perforated peptic ulcer, while on 4 occasions a gridiron incision was initially made when the correct diagnosis eventually proved to be a perforated ulcer. Thus a small exploratory gridiron incision would appear to be a sound procedure in such a doubtful case. With regard to chest conditions the more frequent mistake is to delay operation in a case of perforated ulcer fearing that a diaphragmatic pleurisy is responsible for the symptoms. This is especially so in late cases of perforation, when the respiratory rate may be increased owing to the supervention of peritonitis and the board-like rigidity is no longer present.

The classical pitfall of the tabetic crisis rarely gives rise to difficulty if the condition is remembered. As Hunt and Jewesbury (1938) have pointed out, a perforated peptic ulcer occurs sometimes in patients already subject to disease of the nervous system, and I have encountered several penetrating ulcers of the lesser curvature in tabetic subjects. The important factors in the diagnosis are as follows. (1) A normal pulse must be completely disregarded in arriving at a diagnosis. Any increase of pulse rate is a prognostic sign of some gravity. (2) "Grunting" respiration, and absent or reversed abdominal breathing. (3) A small percentage of cases exhibit a rise of temperature, but only after a number of hours have elapsed and in cases of "leaking" ulcer; usually the temperature is subnormal. (4) Marked tenderness of the recto-vesical pouch or pouch of Douglas. Widespread peritoneal involvement is also indicated by the pain experienced when the patient turns on his side for rectal examination.

Hyperaesthesia is not of frequent occurrence, although occasionally it is so pronounced that shaving of the abdominal wall must be postponed until anaesthesia has been induced.

Immediate Prognosis

As has been pointed out on numerous occasions, and more recently by Grey Turner (1938), the number of hours elapsing between the onset of the perforation and the operation is the most important single factor in assessing the immediate outlook. This point is once more emphasized by the present series. Among the 175 cases there were 28 (16%) deaths. In 19 of these the number of hours was specifically mentioned; the delay ranged from 3 hours to 7 days, the average being 25.5 hours. If 2 very delayed cases are excluded—i.e., 5 and 7 days—the average period between the onset of the perforation and the operation in these fatal cases was 10.4 hours. The remaining 9 cases were simply described as "late."

Another important factor is the site of the ulcer, the perforated gastric ulcer being regarded as having a somewhat worse prognosis. This view should, in my opinion, be modified by grouping duodenal, pyloric, and juxta-pyloric ulcers together, as the prognosis appears to be identical in these categories; but in perforation of the stomach elsewhere there is not so good a chance of survival. Among the fatal cases were 6 ulcers of the

lesser curvature of the stomach, operated on within 3, 4, 5, 10, and 24 hours of the perforation.

The third factor is one which does not seem to have had the emphasis its importance merits. While it has been generally recognized that the combination (in whatever order) of perforation and haematemesis is usually a fatal one (Gordon-Taylor), it has been overlooked that the presence of any intercurrent disease renders the prognosis infinitely worse, irrespective of the factors mentioned above. It would appear that the average individual can survive an acute perforation of a peptic ulcer operated on within reasonable time of the onset, provided he suffers from no other condition militating against his chances. In the present series, among the deaths, it was established that the following conditions had been present before operation: angina, chronic myocarditis, or auricular fibrillation, 6 cases; chronic bronchitis, 2; diabetes mellitus, 3; chronic nephritis, 1; exophthalmic goitre, 1; syphilis, 1. Thus, in 50% of the fatal cases an intercurrent disease was present.

The most dangerous period appears to be three or four days after the operation, death being probably due to peritonitis and toxæmia. In 23 cases death occurred on an average 9.6 days after the operation, but if 3 delayed cases are excluded the average was 3.8 days. In the remaining 5 cases the duration of the period between operation and death was not clearly indicated.

Future Prognosis

It is regarding the patient's future that conflicting views are expressed (Cable, 1938; Scotson, 1933). The figures given in Table III strongly suggest that, provided the patient adheres to a strict dietary for six months after the operation and maintains dietetic care thereafter, his prospects are good. At the same time many symptom-free patients stated that they were taking no dietetic precautions whatsoever. The patient's occupation often gives rise to difficulties, as lorry-drivers, bus-drivers, tram-conductors, etc., have not the same dietetic facilities as individuals in other trades. In the present series 89 cases were successfully followed up. This may seem a small proportion of the whole, but is accounted for by the fact that Liverpool has a large floating population, and that in several instances the only address which the patient could give was that of a seamen's hostel. Of these 89 some were interviewed and examined, others replied to a questionnaire either personally or through their family doctor, and a certain number were radiographed.

TABLE III

Total number of cases followed up	89
Symptomless and carrying out their former employment	51 (57%)
Trivial or occasional mild symptoms not severe enough to cause much inconvenience or loss of work	28 (31%)
Troublesome symptoms causing definite inconvenience or loss of work	10

TABLE IV.—Subsequent Operations (12 Cases)

Gastrectomy (J. C. R.)	6 cases
P.G.E. (J. C. R.)	3 "
P.G.E. (by other surgeons)	2 "
No ulcer found	1 case

It is not wise to base the prognosis on the appearances of the ulcer and adjacent parts at the operation, especially in the common perforation in the vicinity of the pylorus and first part of the duodenum. Owing to the marked oedema and subserous cellulitis present in the vicinity of the ulcer little reliable information can be obtained regarding the future size of the lumen of the pylorus. In 6 cases of the present series it was noted at operation that there was a tendency to pyloric stenosis, and that subsequently a posterior gastro-enterostomy would be required. These particular cases were radiographed some months later,

and in 5 instances the barium meal revealed a normally or even rapidly emptying stomach. In all, 20 cases were radiographed at varying intervals after the operation, usually a period of six months (Table V). These were largely drawn from those individuals still complaining of pain.

TABLE V.—Showing the Radiographic Results in 20 Cases

Duodenal ulcer	4
Juxtapyloric ulcer	5
Lesser curvature ulcer	1
Pyloric stenosis	1
Pylorospasm	1
Distortion of duodenal cap due to adhesions	3
No ulcer	7
Rapidly emptying stomach	8
Normally emptying stomach	11

Treatment

Immediate operation is essential in every case. Possibly two justifiable reasons for slight delay are for the administration of insulin and glucose (the latter by the rectal route) in diabetes, and for the insertion of a cannula for continuous intravenous 5% glucose solution in late or feeble cases.

After a lengthy trial with various anaesthetics I came to the conclusion that open ether anaesthesia was safest in the average case, especially as the very urgency of the operation often renders it impossible to obtain a skilled anaesthetist. A combination of gas-and-oxygen and local anaesthesia is a useful alternative, while the latter alone (in the form of a rectus block) is indicated in the late case. Splanchnic block is contraindicated in view of the possibility of carrying infection from the soiled peritoneal cavity into the retroperitoneal tissues.

The operation should, in my opinion, consist of simple closure of the perforation and of removal of the fluid present in the peritoneal cavity. Drainage is necessary only in the late case. Closure of the perforation can be carried out by a double row of purse-string sutures if the site is the lesser curvature, the anterior wall of the stomach, or the pyloric antrum. When the ulcer is situated in the pyloro-duodenal region a double row of sutures is advisable; and, indeed, this method is often preferable as a routine procedure at any site. Many textbooks advise that the row of sutures be applied in a vertical direction in order to obviate narrowing of the pylorus. In my experience, however, attempts to insert sutures in a vertical line result in the catgut tearing through the oedematous friable tissue, especially when it is necessary to draw the body of the stomach upwards and towards the left to permit access to the duodenum. It was in several of these cases, sutured in a horizontal line, that pyloric narrowing was suspected at the operation but was subsequently disproved radiographically some months later. If the tissues in the vicinity of the perforation are very friable it is advisable to insert the first few sutures a short distance from the actual hole and to tie the knots of these sutures loosely. With regard to the peritoneal fluid present, although it probably remains uninfected for several hours, perhaps twelve, it is advisable, and is my custom, to remove the fluid by swabbing with abdominal packs or by suction. This is especially necessary when the fluid is turbid, glairy, or subpurulent. It is generally conceded that the amount and thickness of the fluid are factors in determining the prognosis.

With the exception of the case in which advanced pyloric stenosis is present, the performance of a gastro-enterostomy at the original operation is contraindicated for the following reasons. (1) The operation is unjustifiably lengthened by carrying out the additional procedure. (2) The ulcer which has perforated may be of the "acute" type. On two occasions I have operated on individuals suffering from repeated bouts of vomiting dating from an opera-

tion for perforation some years previously. In neither case was any trace of an ulcer or pyloric obstruction found, and following the "undoing" of the gastro-enterostomy all vomiting and other symptoms ceased. (3) Should a subsequent operation become necessary a gastro-enterostomy is rarely the wisest and most efficacious procedure. It is not proposed to enter here into the relative merits of the various "second" operations advocated, as it is hoped to deal with this difficult problem in a subsequent communication. It is sufficient to say that I prefer partial gastrectomy to any short-circuiting procedure.

Drainage by a tube inserted into the pelvis via a supra-pubic stab incision is necessary when the peritoneal fluid is thick, and in late cases, perhaps when eight to twelve hours have elapsed since the acute onset.

Drainage through the main wound is unnecessary and tends to lead to an incisional hernia. For some years I have drained the right kidney pouch through a stab incision in the right flank in certain late cases, in the hope of preventing the development of a subphrenic abscess. Unfortunately this did not achieve its purpose, and supphrenic abscess appeared to develop in some of these late cases in spite of the additional drainage.

After-treatment

In desperate cases continuous 5% glucose solution by the intravenous route may be a life-saving measure, especially when the water balance is seriously disturbed, but it is not necessary in the average case. Rarely, repeated vomiting due to temporary occlusion of the pylorus by spasm or oedema must be treated by repeated or continuous aspiration of the stomach contents by means of a Ryle's tube. In the present series in only 2 cases did the vomiting persist and necessitate a gastro-enterostomy, which was successfully carried out ten days after the initial operation.

Summary

A personal series of 175 cases of acute perforated peptic ulcer is reported, the mortality being 16%.

The importance of recognizing that a subnormal temperature and a normal pulse rate must not influence the diagnosis is emphasized.

Apart from the time factor and the site of the ulcer, it is pointed out that the immediate prognosis is greatly influenced by the presence of intercurrent disease such as diabetes or myocarditis.

The present figures suggest that 57% remain symptom-free and able to continue their usual employment, provided dietetic discretion is observed. A further 31% have mild or trivial symptoms.

The operation should consist of simple closure of the perforation and removal of the peritoneal fluid, together with drainage in late cases. Objections to the routine practice of also carrying out a gastro-enterostomy are enumerated.

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The Academy of Sciences of the U.S.S.R. has awarded the Pavlov Prize for 1940 to Prof. Maria K. Petrova of the Pavlov Institute of Physiology and the Institute of Evolutionary Physiology and Pathology of the Higher Nervous Activity. Prof. Petrova is known for her study of experimental neuroses, their mechanism and therapy.