A dose of blue pill or calomel twice a week, or even on alternate nights, followed by a saline in the morning, is one of the best methods of keeping the tension down. In many cases where the vessels are considerably thickened iodide of potassium in 5 or 10 grain doses three times a day, if the patient stands it, is very useful. Where the iodide of potassium and sodium are not well borne a good result may be obtained from organic combinations such as iodipine and others. High-frequency currents appear to have a great power of lowering blood pressure; I have many cases in which they have been of much service. I have heard of similar good effects of static electricity, but I have had no personal experience of its use.

In this paper I have said very little about the diastolic pressure, which is now generally reckoned to be that at which the oscillations of the artery are greatest. My reason for this is that I find it very much less easy to estimate the diastolic pressure accurately than the systolic with the ordinary instruments for clinical use. It is fairly easy to do this accurately with Gibson's sphygmomanometer, but this is not well adapted for bedside use. For clinical use I think Oliver's is the best for this purpose, and I have had one made by Boullite, which may perhaps be ultimately useful. For ordinary purposes I think Martin's or Lockhart Mummery's and von Basch's sphygmomanometers and Dudgeon's sphygmograph are the most convenient instruments.*

THE DIAGNOSIS AND OPERATIVE TREATMENT OF CHRONIC GASTRIC AND DUODENAL ULCER:

AN EXPERIENCE OF THREE AND A HALF YEARS.

BY

DAVID DRUMMOND, and RUTHERFORD MORISON,
M.D., F.R.C.S. ENG.,
SENIOR PHYSICIAN, SENIOR SURGEON,
ROYAL VICTORIA INFIRMARY, NEWCASTLE-UPON-TYNE.

The co-operation of physician and surgeon is never more desirable than in the consideration of cases of gastro-duodenal disturbance. The pitfalls in diagnosis are so many, and the temptation so natural for the physician on the one hand to regard the majority of cases as medical, and for his surgical colleague on the other to view them as cases requiring operation, that when either works alone there is considerable risk of his being led to one-sided conclusions.

We feel, therefore, that a combined statement of the work we have done and the results we have obtained during the whole time we have been associated as colleagues in the infirmary requires no excuse. This co-operation of ours covers a period of three and a half years, from January, 1905, to June, 1908, during which 123 cases in which a diagnosis of chronic gastric and duodenal ulcer was made were treated by gastro-enterostomy.

Of these cases, 72 were gastric, 28 were duodenal, and 23 were not classified. The usual history in all was one of long-continued "indigestion." There had been pain after taking food, and generally occasional vomiting, which relieved the pain. Often the first warning to the patient of serious trouble impending was the appearance of blood in the vomited matter. With or without a variety of treatments there had been periods of health so good as to give hopes of a cure, hopes sooner or later, however, to be disappointed by a relapse. The truth is that the healing of a chronic gastric or duodenal ulcer is often difficult, and occurs much less frequently than has been supposed. It is certain, too, that after the healing of one ulcer others are likely to form. We have also learnt by observation that an active ulcer may, for some reason unknown to us, lose its sensibility and an apparent "cure" be thus brought about. During the painless time, small dietetic restrictions and general care of the health suffice to keep the patient comfortable; but after a time, these restrictions have to be more rigidly practised, the intervals of ease tend to become shorter, and eventually a condition of invalidism is established.

* These instruments can be obtained from Mr. Hawksley, 357, Oxford Street.

It is also an increasingly common belief, especially amongst surgeons, that cancer of the stomach is frequently if not usually sequential to a chronic gastric ulcer, but our experience, clinical and pathological, does not confirm this view. Setting it aside, the arguments in favour of operation in cases of chronic gastric and duodenal ulcer are strong enough. That these ulcers seldom heal, that the dangers of perforation or haemorrhage are very real, and that the interference with many of the pleasures and much of the usefulness of life is undoubted, are facts which suffice to justify the risk when the good results of operation are borne in mind.

DIAGNOSIS.

If asked, "In what class of patients is gastric ulcer most prevalent?" the majority of physicians and practitioners answer without hesitation in favour of the claim of the young stout anaemic servant girl. The answer is not correct. A fair number of perforating ulcers occur amongst such young women, but they are of the acute variety which probably own a distinct pathology. (For our views as to this see *Lancet*, 1906, vol. i, p. 961.)

Chronic gastric and duodenal ulcers occur at a later age. Like similar chronic ulcers elsewhere, they probably depend on septic inflammation. They select by choice the stomach or duodenal wall of the thin neurotic.

Our statistics show that chronic gastric ulcer affecting the cardiac portion of the stomach is a disease almost special to women, and chronic duodenal ulcer almost special to men (more than 80 per cent. in both cases), and that for both the largest number of operations were done in the decade from 35 to 45, though each decade after the age of 15 is represented in the series. The pyloric area is that most frequently attacked (70 per cent.), and, on the stomach side, the lesser curvature.

Ulcers of the duodenum we have found, contrary to the general statement, occur with rather greater frequency on the inner wall than on the outer (55 per cent. and 45 per cent.), and occasionally involve the whole lumen. They are rare except in the first part.

SYMPTOMS.

There are three symptoms common to chronic gastric and duodenal ulcers—pain, vomiting, and the discharge of blood—but that all of these may be present without any ulcer we have had abundantly proved. A diagnosis upon these three symptoms alone, especially in the case of women, has led to frequent mistakes. A careful and detailed consideration of these symptoms will, however, lead to correct diagnosis in an overwhelming majority of cases.

Pain.

This is the most important, may, indeed, be the only, symptom of a gastric or of a duodenal ulcer, but to take the high rank we give it must have quite a definite history. Unless it has occurred after the ingestion of food, and was absent when the stomach was empty, no serious diagnostic importance attaches to it. Our practical rule, based on these considerations, is that a pain occurring after 4 o'clock in the morning—that is, before breakfast—is not likely to be associated with either chronic gastric or chronic duodenal ulcer. In cases of old standing large indurated ulcers, when the period of chronic invalidism has been reached, the present complaint may be of pain only, but it is of a pain so persistent as to make life a misery, a pain which neither rest nor diet removes, and which opiates can only alleviate. In these cases, moreover, there is generally a previous history of vomiting and haematemesis, and frequently of the recovery from a perforation.

If there is an ulcer and the pain is continuous, such pain is more likely to be due to cancer than to a simple ulcer. In cancer the pain is attended by loss of appetite, but in ulcer the patient would willingly eat if he dare. Excepting in the case of cancerous ulceration, if the pain is not relieved at once by vomiting the contents of the stomach, it is not likely to be due either to a gastric or a duodenal ulcer. The time at which the pain appears has some value in localization, but not all that has been claimed for it. Beginning soon after a meal, it suggests an ulcer towards the cardiac end of the stomach, one hour later an ulcer at or near the pylorus, and from two to three hours after an ulcer of the duodenum. The explanation in each instance is that the pain is produced by food contact. The pain of

a gastric ulcer is rarely relieved by taking food. When, on the other hand, the ulcer is in the duodenum, the pain is, as a rule, so relieved. The explanation of this relief from pain in duodenal ulcer is that the introduction of fresh food causes closure of the pylorus and prevents food from passing over the ulcer for a time. Night pain occurring in the early hours (1 to 2 in the morning) has almost invariably in our experience been associated in gastric cases with an ulcer adherent to the pancreas, and though we have no explanation to offer, we have, before operation, more than once made a correct diagnosis of this condition, based on night pain. The pain of a duodenal ulcer is also frequently worse at night, and is often relieved by sipping hot milk or taking a little food. It is generally relieved by flexion of the trunk, consequently the patient either lies curled up on one or other side, or on the back with the legs drawn up, or sits leaning forward in bed.

Paroxysmal pain, closely resembling that of biliary colic, is associated with an ulcer close to, or involving, the pylorus, either on its gastric or duodenal side. It is probably due to forcible irregular contraction of the unstriated muscle fibre of the pyloric end of the stomach.

Vomiting.

This may be a most misleading symptom, and requires particular attention. It may be an important symptom of gastric but *not* of duodenal ulcer. It should bear a definite relationship to the pain and to the ingestion of food. Vomiting without severe pain, or occurring at other than fixed periods after food, is not a symptom of any value in the diagnosis of chronic gastric ulcer. The vomited matter is most likely to be nothing but ingested food, and after the stomach has been emptied by the act of vomiting the patient should feel entire relief. The sickness is comparatively easily controlled by limiting the quality and quantity of food, and by rest. Vomiting which is not controlled by rest in bed or by fluid diet is quite unlikely to be due to ulcer. Uncontrollable vomiting is not due to chronic gastric ulcer. Vomiting is rare in cases of duodenal ulcer. When it occurs patients will often tell how, having discovered that relief followed emptying of the stomach, they had purposely induced vomiting in order to remove a severe pain.

Blood.

The presence, repeated at intervals, of relatively small quantities of blood in the vomited matter is an important symptom of chronic gastric ulcer. Other forms of blood loss in this relation do not possess the same significance. Blood, especially when only discoverable microscopically in the stomach contents or in the stools, suggests a cancerous rather than a simple ulcer. Profuse, painless, sudden haemorrhage in a young woman is quite unlikely to be due to chronic ulcer, and, in an elderly patient, suggests rather cirrhosis of the liver. Bleeding from a duodenal ulcer, if moderate in amount, is usually indicated by a black or dark stool, and, if free, gives rise to sudden and profuse vomiting, accompanied by faintness and a cold sweat, and followed by a profuse black liquid stool, and by feebleness and anaemia if the patient recovers. Slow bleeding from a duodenal ulcer may easily escape recognition as a cause of profound anaemia unless careful examination of the faeces be made.

PHYSICAL SIGNS.

The physical signs on which we place most reliance are:

A Tender Spot.

Over the ulcer, whether in stomach or duodenum, a deep, well localized, tender spot is generally discoverable which serves as an aid to diagnosis.

Rigidity of the Overlying Muscles.

The abdominal muscles covering an active gastric or duodenal ulcer will be found to be rigid, and this rigidity is quite localized. The hardness of the upper part of the right rectus overlying an active pyloric or duodenal ulcer is therefore an important sign.

A Tumour.

A tender nodule or an indefinite induration, especially in the neighbourhood of the pylorus, with a history of long-standing stomach trouble, are characteristic of chronic ulcer, and furnish its most important sign. A considerable

tumour may be caused by inflammatory exudation and induration round a chronic ulcer, but this is rare. A definite movable tumour suggests a cancerous rather than a chronic ulcer.

HISTORY.

Healing of a pyloric ulcer, whether on the gastric or duodenal side, is followed by more or less contraction and stricture of the pylorus, with resulting response of the stomach to the changed conditions. In the early stages, hypertrophy of the stomach walls and diminution in the size of its cavity compensate for the diminished lumen of the pylorus, and with ordinary dietetic care no trouble results. At a later stage the gastric mucous membrane is red, swollen, and irritable from inflammation—a fact we have observed with Rovsing's gastroscope—and fresh ulceration increases the damage to and the contraction at the outlet. It is at this stage and under the conditions described that the attacks resembling gall-stone colic, which not infrequently cause insuperable diagnostic difficulties, arise. These we attribute, as we do gall-stone and other colics, to forcible contractions of the unstriated muscle fibre in walls stimulated by inflammation of the mucous membrane beneath, contractions which serve to obstruct still further a free discharge from the cavity involved.

Finally, dilatation of the stomach follows increasing contraction of its outlet, and all the symptoms change. Thus, pain ceases to be an important symptom, severe pain is rarely complained of, and the character and quantity of vomited matter become of the greatest importance. When dilatation has fully developed, the vomited matter is frothy and has a yeasty smell. It contains particles of food which should have been digested hours or days before; it occurs towards evening from the gradual filling of the stomach during the day; and the quantity is in excess of that eaten, sometimes sufficient to fill a basin of considerable size.

With the history of an ulcer years before, and this type of vomiting present, the probabilities of a cicatricial stricture near the pylorus and of a dilated stomach are very strong. They are converted into certainties if inspection shows, through the thin parietes, the outline of a dilated stomach, which exposure to the cold air or friction may stimulate to well-marked peristalsis, the contraction passing from left to right; if continued splashing of the stomach can be demonstrated on succussion; if auscultation and percussion offer evidence of the presence of dilatation; if a nodule freely movable on respiration can be palpated in the neighbourhood of the pylorus; and if, failing all these signs, the outline of the dilated stomach is made apparent by distension with air or gas. Furthermore, these patients are always strikingly emaciated, whereas those with chronic ulcer of the body of the stomach may be surprisingly well nourished. Another secondary effect of gastric ulcer is seen in the hour-glass stomach, but, as the diagnosis of this can only exceptionally be guessed at, we merely mention it here since the treatment may require an addition to the ordinary operative measures.

SUMMARY.

To recapitulate shortly. The symptoms which distinguish a chronic gastric from a chronic duodenal ulcer relate chiefly:

1. *To Pain.*

To the time at which pain occurs after taking food, that is, soon in gastric, later in duodenal ulcer. The influence of food upon the pain; solid food increasing gastric, but relieving duodenal pain. The effect of rest in bed on the pain; rest relieving gastric, but producing no good effect on duodenal pain.

2. *To the Character of the Vomiting.*

Its close relationship to food and pain; its involuntary character in gastric, and its voluntary appearance in cases of duodenal ulcer.

3. *To the Form of Haematemesis.*

Recurrent, and in relatively small quantities in gastric, overwhelming and followed by melaena in duodenal cases.

PYLORIC STRICTURE.

The diagnosis of stricture in the neighbourhood of the pylorus is so easy that no excuse can be offered for

mistakes. With the history of a chronic gastric or duodenal ulcer some years back, and periods of remission of the symptoms, each remission being followed by a less perfect recovery until the evidences of stomach dilatation are complete—with such history the diagnosis of cicatricial stricture as a consequence of the ulcer is unmistakable. This is fortunate, as these cases demand operation and are the most satisfactory of all in results.

With proper care it is possible in most cases to form a definite diagnosis of gastric from duodenal ulcer, but occasionally this is difficult. We have observed certain gastric ulcers situated on the lesser curvature, about the junction of the middle with the pyloric third of it, to cause symptoms which have misled us. Notes of the two following cases will serve as examples:

CASE I.

B. A., aged 39, miner, was admitted for stomach trouble of a year's duration. About nine years ago he was laid up for three months with pain in the right side below the costal margin. The pain came on one and a half to two hours after food and was relieved by vomiting, which was frequent and occurred soon after the pain had commenced. The pain was also relieved by taking hot food or by sipping hot milk. After three months of treatment with medicine and light diet he recovered.

After this attack nine years ago he had frequent return of pain (once a month or so), coming on one and a half to two hours after food, with occasional attacks of vomiting. These attacks usually lasted for a week. He had never vomited blood, but had passed black motions. He had lost weight and become thin and pale.

On admission there was rigidity of the upper part of both abdominal recti muscles, with deep tenderness on pressure under each. The operation showed adhesions between the stomach and liver and the parietes, and an indurated ulcer, the size of a shilling, on the lesser curvature of the stomach at the junction of the middle with the pyloric third. The duodenum was normal.

CASE II.

J. C., aged 37, a platelayer, admitted complaining of pain after food and weakness. Nine years' history of fairly frequent attacks, lasting a month, of pain at a definite spot beneath the junction of the seventh and eighth right costal cartilages, coming on from two to three and a half hours after food, and relieved by taking food. Never had pain in the night or before breakfast. He had carried biscuits and sweets about with him, as he had found that by taking these pain would be relieved. Occasional vomiting, sometimes involuntary but usually voluntary, would also relieve him for a time. No hæmatemesis, no melaena, but had lost much blood from bleeding piles; lost some weight lately; medicine had given him only temporary relief.

No physical signs in abdomen. Operation: Median supra-umbilical incision. Big, thick-walled stomach found. The duodenum was examined, along with the pylorus, and was found to be normal. On the lesser curvature of the stomach, at the junction of the middle with the pyloric third, there was a hard cicatricial area, the size of a florin. Examination of the interior of the stomach showed in the centre of this area a typical chronic gastric ulcer.

The fact that vomiting was a marked early symptom in these cases might have helped us to a more complete diagnosis. As it was, no mistake, so far as the patient's interests were concerned, was made. It is, however, a fact that serious and damaging mistakes are possible, and of this we have abundant proof in the visits of patients on whom gastro-enterostomy has been performed for the gastric crisis of locomotor ataxia and for other forms of "indigestion," which have not been improved, but frequently made worse, by surgical interference.

The greatest safeguard is to detain cases in which there is any doubt for a period of observation and treatment and for consultation between physician and surgeon before operation is decided upon.

Though we have not neglected examination of the stomach contents, it is not our intention to consider this matter in our present paper, partly because we have nothing to add to what has become common property, but chiefly because we have learnt to attach less importance to any of the known laboratory tests than to ordinary clinical methods.

THE OPERATION.

(By Mr. Rutherford Morison.)

The operation performed in all of these cases was gastro-enterostomy. I have always had, and have still, a prejudice against any operation which alters so materially the anatomy and physiology of important viscera as this does. It is, however, of greater importance to recognize that such a prejudice must not be pitted against the results of careful

experiments. These have proved that, after gastro-enterostomy in the great majority of cases, gastric (duodenal) ulcers heal, that the health of patients for several years after at least has appeared to be quite satisfactory, and that no other known stomach operation holds out equal promise of success. Excision of the ulcer appears so reasonable a proposition that it probably deserves a fair trial in suitable cases, but, if the opinions I hold now are correct, there is no place for it. The same objection would apply to Finney's operation, and to pyloroplasty when the pyloric stricture is the result of ulceration. It is upon the experience derived from a large number of cases in which I had performed pyloroplasty that my present practice is based. The immediate effects of cicatricial stricture of the pylorus treated by pyloroplasty were excellent, and in many the permanent results have never been equalled by any gastro-enterostomy case I have seen; but in about 20 per cent. of cases, after an interval of relief extending in some instances over several years, there was a return of the pain and vomiting, necessitating a second operation. After gastro-enterostomy, on the other hand, the relief was immediate, and mostly permanent. In all of the cases that relapsed after pyloroplasty I found that the cause of the symptoms was fresh ulceration in the neighbourhood of the pylorus, and that there was never any return of the contraction of the orifice. The pylorus, indeed, has generally been described in the notes as fixed by a mass of adhesions, and so patent as easily to admit two fingers. The lesson clearly was that gastro-enterostomy not only allowed existing ulcers to heal, but prevented the formation of fresh ones, and for some years now I have taught that this effect is chiefly the result of neutralization of the acid in the gastric juice, and this opinion is also expressed by H. J. Paterson.¹ That the acid contents of the stomach have largely to do with ulcer is proved by the following facts: That ulcers are practically only found in those parts of the digestive tract which have acid contents—namely, the stomach and first part of the duodenum; that ulcers of the duodenum can be cured by gastro-enterostomy as certainly as ulcers of the stomach; and that, so far as my experience allows me to dogmatize, those not cured by gastro-enterostomy alone heal after a second operation undertaken for occlusion of the pylorus. The experiments of Bolton² on gastro-toxic serum are of great importance in this connexion. They show that an animal can elaborate in its blood, as the result of absorption of the tissues of a similar animal, and therefore presumably of its own, a poison which is potentially able to cause necrosis of the mucous membrane of its own stomach.

His experiments also proved that a dose of gastro-toxic serum sufficient to produce ulceration in healthy animals would not produce it in those to which sodium bicarbonate had been administered in sufficient quantities to neutralize the gastric juice, and the extent of the ulceration was more pronounced in those to which a solution of hydrochloric acid (0.5, 1 or 2 per cent.) had been administered previous to the injection of the gastro-toxic serum. Those who accept the experimental proof of passage of food through the pylorus after gastro-enterostomy cannot explain the usual curative effects of this operation except by adopting the view of modification of the acid contents of the stomach.

In respect to gastric ulcers, another element aiding recovery is that with a gastro-enterostomy opening it is unlikely that the stomach should become dilated, and recurring dilatation of the stomach is, I believe, a much more common condition than is generally admitted. Nothing would be more likely to aggravate an existing ulcer than attacks of dilatation, and the operation obviates this liability. It may be also that the operation has, by altering metabolism, some inhibitory effect on the production of the toxin which, as suggested by Bolton's researches previously referred to, is the cause of gastric ulceration. This point will, I hope, be considered in further experiments.

Since the introduction of the posterior operation I have adopted that for choice, as leaving less anatomical disturbance than the anterior one. If there was any difficulty in the way of its performance, I did not hesitate to perform the anterior operation, and have found no difference in the results.

When the ulcer is at the pylorus or in the duodenum, I make the opening between the jejunum and stomach as

near the pylorus as possible. When the ulcer is in the body of the stomach I endeavour to get the opening placed as nearly opposite to it as I can. Mayo Robson and Moynihan in this country, and Mayo in America, to whom surgeons all the world over are indebted for the present position of stomach surgery, are agreed that the opening in the jejunum should be as close to the duodeno-jejunal junction as possible (the no-loop operation), but I cannot accept their teaching on this point, which, so far as I know, is based upon mechanical considerations concerning the diminished chance of vicious circle vomiting, the greatest terror of the operation.

Sixteen years ago³ I expressed the opinion, and showed specimens which I believed supported it, that vicious circle vomiting depended more upon the capacity for contraction of the stomach wall than on any other factor. I still believe that vicious circle vomiting is due to what is now called acute dilatation of the stomach, and that mechanical obstructions are as much a factor in the one as in the other. Whether this is true or not, there is no doubt that when once vicious circle vomiting is fairly established, the best, probably the only, chance for the patient is to make an anastomosis between the jejunum proximal to the opening and a portion distal to it. With the no-loop operation this would be difficult, might indeed be impossible, so I have always left a loop of from 4 in. to 8 in. between the commencement of the jejunum and the stomach opening, to be utilized if necessary.

Shortly, the steps of the operation I perform may be described as follows:

The abdomen is opened in the middle line, from the ensiform cartilage above to the umbilicus below.

The stomach and duodenum are drawn forward out of the abdomen as far as convenient, are thoroughly examined, and the pathology determined as far as possible from the outside (the gastroscope of Rovsing may be introduced at this stage through a small hole in the anterior wall). After tearing a hole through a non-vascular part of the mesocolon and elaborate gauze packing, 3 in. of the first part of the jejunum are temporarily fixed to the posterior wall by my catch forceps in such a direction that the proximal part of the intestinal loop points to the cardiac end and lesser curvature, the distal to the pylorus, and extending to the greater curvature. The first posterior row of sutures is then introduced, extending from one catch forceps to the other (Fig. 1), and an incision is made through the peritoneal and muscular coats, not less than 2 in. long, but not through the mucous membrane, $\frac{1}{2}$ in. anterior to the first row of sutures.

An opening large enough to admit the forefinger is next made in the mucous membrane of the stomach, through which its cavity as well as the pylorus and duodenum are explored. On removing the finger, a strip of gauze is packed into the gastric opening, and the mucous membrane of the stomach and jejunum are divided for the full length of the incision. All spouting vessels, in either stomach or jejunum, are tied at this stage.

The angles of the jejunum and stomach incision are next brought together, each with a suture including all the

coats, one for the upper, another for the lower angle (Fig. 2), and the accurate approximation of stomach to jejunal opening posteriorly is made easily by an ordinary continuous overhand suture through all the coats (Fig. 2).

Until I discovered that the pouting of the cut mucous membrane could be infolded by a special suture, anteriorly, this always made a difficulty, and tempted me for a time to use buttons; now, however, by using a suture which begins on the mucous surface and goes through the peritoneal coat on one side and back through the mucous to the peritoneal surface of the other side, this difficulty has been surmounted (Fig. 3). (I may say that here, as in many other ways, I am indebted to the *post-mortem*

Fig. 1.

room. The form of suture described corresponds with that usually employed by the *post-mortem* room porters for closing the skin.) Over the anterior suture comes a second layer of Lembert sutures, and the opening is closed (Fig. 4).

At each end a purse-string suture is made to surround the portions of bowel and stomach damaged by the catch forceps, and after tying this the edge of the opening in the mesocolon caught in clip forceps is tied into it. One or two interrupted sutures anteriorly and posteriorly are

also introduced through the opposed surfaces of stomach and jejunum, and after being tied the edge of the mesocolon is similarly fixed to them, thus occluding that opening.

By the use of this method the transfixion of vessels by the needle and troublesome bleeding may be avoided.

Before replacing the stomach the distal jejunal loop is drawn over to the right side parallel to the pylorus. The abdominal wound is closed in the ordinary way with tier sutures.

In the case of hour-glass contraction I have done three types of operation:

1. If the contraction is moderate, by making a long anastomosis immediately under and through the contracted stomach area.

2. With pronounced stricture, by a longitudinal incision through the stricture and opening this transversely (thus widening the anterior wall of the stomach), followed by gastro-enterostomy at the pyloric end.

3. When the stricture is specially narrow, by a long incision through the centre of it and spreading the stomach walls form a new posterior wall, leaving the spread out hour-glass as the centre of it and making an entirely new anterior one, followed by gastro-enterostomy at the pyloric end.

When occlusion of the pylorus is necessary this has been accomplished by clamping it with sufficiently strong forceps to destroy the mucous coat, then tying a thick silk ligature round it in the groove made by the forceps tightly enough to maintain the occlusion, and over this placing a row of Lembert sutures to bury the silk.

STATISTICS.

Of the total number of patients in whom gastro-enterostomy was performed, 118 recovered, and 5 died. In several of these other operations in addition to gastro-enterostomy were done at the same time.

Fig. 2.

After-history.

For purposes of classification we have called our cases gastric ulcers, pyloric ulcers, and duodenal ulcers.

We have divided the gastric ulcers into two classes—namely, ordinary and those causing hour-glass stomach. The pyloric into those with and those without stenosis.

Gastric Ulcers.—The cases numbered 14, all women; 8 of these report themselves as perfectly cured at periods of from four years to eighteen months since the operation. Two are very much improved, but still have some symptoms. One of these, operated upon twenty months ago, has no vomiting now, and only occasional gastric discomfort, but has had two attacks of melaena. She had an ulcer on the lesser curvature of the stomach. The other, operated on two years and ten months ago, has to be careful of what she eats. Three cannot be traced. One patient died, and her history is worthy of record.

Miss R., aged 33, admitted to a private hospital on August 27th, 1900. For five years she had been troubled with symptoms of chronic gastric ulcer and had been unable to take solid food. On August 29th, 1900, her abdomen was opened and the stomach was seen to be thick-walled and dilated. There were signs of old ulceration of the lesser curvature, which was scarred, thickened, and adherent to the pancreas. The stomach was opened, and the pylorus was found to be so small as to admit only a little finger. There were no signs of scar or ulcer at or near the pylorus. Pyloroplasty was performed, and she made a good recovery and left on October 8th, 1900. In December, 1900, she could take ordinary food and had gained weight, but still had some pain. This gradually passed off. She got perfectly well, and was able to eat anything till six years later (beginning of November, 1906), when all her symptoms returned. The pain was so severe that she was unable even to take milk, and lost flesh and strength rapidly. For twelve days she was fed on nutrient enemata only, and during that time gained 21b. 5oz. Previous to operation she looked very ill; her hands and face were livid, and pulse quick and feeble. Posterior gastro-enterostomy was done on November 11th, 1906. She appeared to be no worse the day after the operation, but on the second night, after 10 grains of chloral, she drifted into coma, and died forty-eight hours after the operation. The *post-mortem* examination showed an indurated ulcer 2 in. in diameter on the posterior wall and lesser curvature of the stomach adherent to the pancreas, part of which was exposed in the floor. There was an opening between the stomach and duodenum, where pyloroplasty had been performed, wide enough to admit three fingers. The surgery of the gastro-jejunal anastomosis was good; the kidneys were healthy. (Urine withdrawn by catheter during the comatose state was loaded with albumen, and contained numerous casts; there was no acetone.) The liver showed nutmeg changes with pigmentation. There was some fatty change, but not marked. Our opinion is that she died of starvation from too long postponement of operation.

Ulcers of the pylorus, with symptoms of active ulcer, but without stenosis. There were 16 cases, 10 men and 6 women; 12 have been traced, and of these, 10 are completely cured, 2 still have some symptoms but are greatly improved; 4 cannot be traced.

Cicatricial stricture of the pylorus, the result of ulceration. There were 36 cases, 20 men and 16 women; of these, 3 cannot be traced, 29 report themselves quite cured, 2 report that they are no better.

The first is a woman of 26 years of age. Her history was that for ten years she had pain after food, even with a milk diet. She vomited frequently, and vomiting relieved the pain. On several occasions she had vomited coffee-ground material, the

last time one year before operation. She was much troubled by flatulence and pain in her stomach when not taking food. Exploration of the stomach showed a definite adhesion between the pylorus and omentum, and on opening the stomach the pylorus appeared to be tighter than normal. There was no definite scar or ulcer.

The second case was a man aged 49, who stated that he had never been well since the operation. His appetite had never been good, but he has ceased to work on account of "catarrh of the stomach and physical weakness." In this case operation showed adhesions between the pyloric end of the stomach and gall bladder, and some stenosis of the pylorus, though there was no visible scar or palpable ulcer.

In one of the cured cases in this series the patient, a man aged 58, had gastro-enterostomy performed in 1904 with the Morison bone button for stenosis of the pylorus with active ulceration. In 1906 his symptoms recurred. On opening the anterior wall of the stomach and drawing forward through it the anastomotic opening, this was found to have contracted to such an extent as to admit only the tip of the index finger. He has been quite well since the gastro-jejunal opening was enlarged.

Two patients died, each five days after the operation, from pneumonia.

The first, a man aged 44, had the history and signs of pyloric ulcer, stricture, and much dilated stomach. He was very feeble and thin. Whilst his stomach was being washed out on the day after operation, and after much foul matter had been got out, he was seized with tetany and the washing had to be

stopped. The operation showed an inflammatory mass at the pylorus, with tight stricture of the pylorus and active ulceration. This was confirmed by *post-mortem* examination, which showed that death had resulted from acute lobar pneumonia of the left lung. The surgical wounds were quite healthy.

The second, a man aged 30, had a much dilated stomach, with stricture and ulceration of the pylorus.

Hour-glass Contraction of the Stomach.—There were 6 cases, 5 women and 1 man. Five report themselves cured; 1 states that she is greatly improved, but still has occasional pain after food. In 4 of these cases, on account of the amount of contraction present, gastropasty was performed in addition to gastro-enterostomy; 1 had cholecystotomy (for gall stones), gastropasty, and gastro-enterostomy done. Of these 4, 3 are cured. The fourth is the patient who reports improvement.

Duodenal Ulcers.—There were 28 cases, 25 men, 3 women. Five of these had stenosis of the duodenum, in addition to active ulceration; 20 report themselves perfectly cured, able to take any kind of solid or liquid food without trouble, and in good health. One patient, a man aged 36, had gastro-enterostomy performed in 1904 for duodenal ulcer. He remained well until 1906, when his

symptoms recurred, and an operation was done for occlusion of his pylorus. He remained well as far as his digestive system was concerned, but died in July, 1908, of phthisis pulmonalis. Two report themselves improved, but still have stomach symptoms; 1 of these was operated upon only a year ago, and still continues to improve, his old symptoms, though present, being less marked. In the other, on looking up the notes, the only evidence of organic mischief was adhesions round the first part of the duodenum, but no ulcer could be felt from the inside. It is certain from the notes and the history that at the present time we would not recommend surgical treatment in a similar case. One is not improved, a man aged 28. Dr. Steele, of Middlesbrough, reports "that he was free from symptoms for three months after leaving

Fig. 3.

Fig. 4.

hospital, but later has all the symptoms as before." On looking up the notes of this case we find that the history and operative findings throw grave doubts on the clinical diagnosis of duodenal ulcer, and to-day, on his history alone, he would have been rejected as unsuitable for surgical treatment. Two patients cannot be traced.

Two died.

The first was a woman aged 59. For twenty years she had "indigestion." Pain came on two hours after food, and was relieved by vomiting or by taking more food. Sometimes melaena had been noticed. She was very thin and feeble, had a definite tumour in the pyloric region, and the signs of a much dilated stomach. Operation, January 28th, 1908, showed the "pyloric tumour" to be a Reidel lobe. The stomach was not so much dilated as supposed. On opening the stomach a small ulcer was found on the inner wall of the duodenum, and there were adhesions round the first part. Posterior gastro-enterostomy. Vomiting began soon after the operation, and, in spite of frequent stomach lavage, changes in posture, and a second operation by Mr. Richardson, who rearranged the position of the jejunum, continued till her death on February 7th. The *post-mortem* examination confirmed the operative findings, and showed only a thin dilated stomach, the intestines quite empty, and proptosis of all the viscera.

The second was a man aged 50, admitted April 9th, 1907. For four years he had at times pain coming on two hours after food. The pain was very severe and only eased by vomiting; this would go on for several weeks, then he would get quite well again. Recently he had vomited large quantities, more than he took as food. After a course of medical treatment he went out, and was brought in again on October 4th, 1907, with severe haematemesis, when it was estimated that he had vomited nearly two quarts of blood. As soon as he had picked up from this attack he was sent to the surgical ward, and operation was performed on October 10th, 1907. This showed the stomach much dilated, and a scar on the duodenum. On introducing a finger through the pylorus from the stomach opening an ulcer was felt surrounding and constricting the duodenum near the junction of its first and second parts. Posterior gastro-enterostomy. The patient appeared to be doing well till four days later, when he vomited a large quantity of brownish-green bile-stained fluid. The stomach was washed out morning and evening after this, and though he complained of feeling sick he vomited no more. Six days after the operation, as it was evident he was not improving, and a large quantity could always be washed out of his stomach, the abdominal wound was reopened and the anastomosis was examined. It looked quite normal. The stomach was large and distended, but there was no distension of the visible duodenum or of the proximal loop of jejunum to suggest mechanical obstruction. A lateral anastomosis was, however, made between the loop of jejunum proximal and that distal to the anastomosis, as it was thought that possibly these were temporarily empty. On the following day he looked better than he had done since the operation, said he felt well, and there had been no vomiting, though lavage had been omitted. On the evening of the next day he took "a sudden bad turn," and, without vomiting again, quickly died. The *post-mortem* examination showed intense anaemia of all the viscera, but nothing more than had been discovered already.

Various.—There were 23 cases under this heading; 3 had both gastric and duodenal ulcers. Posterior gastro-enterostomy was performed in all. They are all now quite well. Three cases were operated upon, but no certain evidence of ulcer was obtainable. (This was before the introduction of the gastroscope.)

The first, a man aged 26, had symptoms strongly suggestive of ulcer, and his pylorus was contracted, but without sign of ulcer or scar. He had gastro-enterostomy performed one year ago. He writes that he is greatly improved and has no vomiting, but still has some "indigestion." He can eat any kind of food, and works regularly as a shipwright.

The second, a woman aged 37, operated upon eighteen months ago for stomach pain, vomiting, and haematemesis of five years' duration, still has her old symptoms. During the last month she frequently has had attacks of blood vomiting and vomited blood.

The third, a woman aged 30, operated upon for pain, vomiting, and haematemesis, is improved, but not entirely free from stomach trouble.

Seven cases had a tumour at the pylorus which was thought to be an inflammatory mass round an ulcerated area. Of the 7, 4 cannot be traced (suggestive of malignant disease and death).

One of the remaining three, a man aged 42, operated on in 1905, had a big tumour at the pylorus, a stricture, and a very large stomach. He reports himself perfectly well.

A second man, aged 62, operated upon two years ago, had a big tumour at the pylorus, a stricture, and a dilated stomach. On exploring the pylorus with the finger, a brass ring was discovered impacted there, and removed. He is quite well.

The third, a man aged 47, was operated upon nearly two years ago. A tumour, supposed to be inoperable cancer, was found surrounding his duodenum. He made a good recovery, soon resumed his work as a striker, and has never lost a day's work since. He does not restrict his diet in any way and is quite well.

In 2 cases strictures of the jejunum, one tuberculous, one malignant, less than a foot from its origin, led to stomach dilatation, and caused pain and vomiting. They were mistaken for gastric ulcers and operated upon by posterior gastro-enterostomy, the junction being effected beyond the stricture. Both recovered.

In one case, a girl aged 23, a perforated stomach ulcer had been sutured one year previously. A return of the symptoms led to posterior gastro-enterostomy. She is now quite well.

In one case gastro-enterostomy was done as an emergency operation for profuse haemorrhage, probably from the duodenum. The pylorus was occluded at the same time. The patient, a woman, has since been quite well.

In 6 cases other conditions—cirrhosis of the liver in 1, pancreatic disease in 1, neurasthenia in 4—existed as complications, and the remote results following operation on the stomach have been unsatisfactory, for none of them are materially benefited.

The immediate good effects of gastro-enterostomy have now been definitely proved. What we still require is the histories of patients on whom the operation has been performed several years ago. The longest interval that has elapsed in any case of ours, where frequent opportunities of observation have been allowed, is nine years, and we offer it as an example, though not an entirely satisfactory one.

J. P., aged 36, was admitted to private hospital on November 3rd, 1900. He had a history of stomach trouble, pyloric ulcer with stricture and stomach dilatation, extending back six years. During this time his stomach had been washed out by his wife daily. For the last year he had vomited large quantities of fermented dirty matter towards night if by any chance the lavage was neglected. His general condition was fair, but he was thin (8 st. 12 lb.), and looked worn. Posterior gastro-enterostomy was performed on November 5th, 1900, by simple suture, an inner row through all the coats of stomach and intestine, watertight and haemostatic, and an outer row of Lembert sutures (interrupted)—the Morison method of closing stomach and intestinal wounds now almost universally adopted.

There was a tight cicatricial stricture of the pylorus, which was bound down to the pancreas, and a much-dilated stomach. After the operation all of his old troubles disappeared, and from the time of his recovery he has been able to eat or drink anything, and has gained more than 3 st. in weight, weighing now over 12 st. For more than six years after the operation he enjoyed uninterrupted health. On January 3rd, 1907, he complained of being cold after getting in from business, and his wife noticed that he was pale. Shortly afterwards he complained of being sick, and vomited, his wife thinks, 5 or 6 pints of blood. He was in bed three weeks after this and had melaena. After a holiday in the country he got quite well again, and remained so till November,

Fig. 5.—Ten minutes. Fig. 6.—Twenty-five minutes. Fig. 7.—Forty-five minutes.
Drawings of x-ray findings in case of J. P.

1907, when he had another attack of haematemesis, but not so severe, and he soon resumed work. A third attack occurred in February, 1908, a fourth in April, 1908, and the last in November, 1908. Between these attacks he has been absolutely free from all stomach trouble. His wife says that these attacks have always been brought on by overwork, but admits that he drinks more than an ordinary amount of alcohol.

Examination of his stomach contents after a test meal (toast and tea) shows the presence of free HCl. Lactic acid or other abnormal constituents are not present. Four hours after a test meal of beef, potatoes, and pudding a small amount of meat fibre was washed out of the stomach.

Röntgen-ray Examination.—His stomach was first washed clean with water and the bowel emptied by an enema, which acted well. Eight ounces of hot bread and milk thoroughly mixed with 1 oz. of bismuth carbonate was then given him to eat. Ten minutes after the food had been taken, with the x-ray screen a distinct shadow was seen. The lower outline was definite, and the lowest point was 1½ in. above the umbilicus. The thickest part of the shadow was towards the cardiac end of the stomach, and it gradually tapered towards the pyloric end (see Fig. 5); twenty-five minutes after food the upper outline, which was never as clear as the lower, showed less clearly, and the whole mass looked narrower. In addition to the projection to the right of the midline and some increased darkening towards the pyloric end, there was a definite shadow leading vertically downwards from the lower border of the stomach shadow (see Figs. 6 and 7). That this was not the spinal column was proved by the facts that it was not seen earlier and did not appear above the stomach shadow. The patient was standing up during each examination.

Our interpretation of the findings is that the projection to the right represents the pyloric antrum, and the vertical shadow food escaping through the artificial opening into the jejunum.

For the laborious work of tracing these cases and collecting the notes we are indebted to Mr. Hamilton Drummond.

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PAIN IN MUCOUS COLITIS AND IN IRRITABLE STATES OF THE COLON IN GENERAL.

By T. STACEY WILSON, M.D., F.R.C.P.,
PHYSICIAN TO THE BIRMINGHAM GENERAL HOSPITAL.

UNDER the term "mucous colitis" I include all cases in which there is excess of mucus in the stools, without evidence of ulceration or any definite organic disease; and I do not distinguish between mucous colic, mucomembranous colitis, and simple catarrhal colitis, for I feel convinced that all these complaints have underlying them one pathological condition—namely, an irritable state of the bowel wall, to which the term "catarrh" is fully applicable. The agency producing catarrh of the colon may not always be the same, just as is the case with other mucous membranes. For instance, a bronchial catarrh may be due to an ordinary cold or to the influenza bacillus, or to rheumatism or some other agency.

The secretion of mucus, whether as a liquid, a semi-solid, or as membranes or membranous casts, is, I feel certain, the result of an irritation of the mucous membrane of the bowel. This undue irritability of the bowel may also express itself by pain, the result of abnormal muscular irritability. In very many cases the muscular irritability and the pain which results occur unaccompanied by any mucus or signs of irritation of the mucous membrane. In such a case, while the motor symptoms show irritability of the colon, the condition cannot rightly be called one of mucous colitis. I find this type of colon affection an extremely common one, and I would like to see the term "catarrh of the colon" used to embrace all cases in which there are symptoms due to the irritability of the colon, whether of its mucous membrane or of its muscles.

Pain, although usually present, is not, however, a necessary accompaniment of mucous colitis, and therefore what I have to say is more generally applicable to the larger class of case in which pain in the colon is a prominent symptom, and the appearance of mucus in the stools, while often present occasionally, is by no means a prominent symptom. The pain of which I am speaking seems to be usually due to a peculiar and hitherto little recognized form of muscular activity, which is associated

with varying degrees of hardness of the bowel, combined with a varying amount of increase in its transverse diameter. This peculiar change in the bowel wall is due, I am convinced, to the development of abnormal tonic activity in the muscular coat.

By the careful palpation of the colon in a long series of cases it is comparatively easy to train the hand to distinguish between the presence of normal and of this abnormal muscular tone in the bowel.

PALPATION OF THE COLON.

Where the tone is normal, the colon can be felt in the left iliac fossa as a single fleshy cord, of some ¼ in. or ½ in. in diameter, which can be rolled under the finger without any material discomfort to the patient, unless he be very sensitive; sometimes, in addition, a sense of the presence of air and liquid in the nearly empty bowel can be felt on either side of the muscular cord, showing that this cord is not the whole of the gut, but only one of the longitudinal muscular bands. Sometimes, on the other hand, it is impossible to believe otherwise than that the fleshy cord felt is the whole of the gut completely contracted to the size sometimes of the little finger or less.

In the case of the caecum in the right iliac fossa a similar sensation of a fleshy cord with some crepitus, due to air and liquid, on either side of it may also sometimes be felt, and, in addition, a somewhat firmer and smaller fleshy cord may be palpable external to it, which is the vermiform appendix. Often the presence of the appendix cannot be made out, but sometimes it is quite distinct and clearly to be felt. Where the intestinal wall is found to be of this normal degree of hardness, there is, in my experience, very little probability that the colon is the source of any abdominal pain from which the patient may be suffering, and some other cause will be found for it.

In very many patients, on the other hand, a greater or less degree of abnormal hardening may be felt in the wall of the colon, varying in degree and extent from the well-known hard tumour of some 2 in. or more in diameter, which occupies the situation of the caecum in most cases of moderately severe acute appendicitis, and which is shown by careful examination to be the caecum distended with gas and with its walls of board-like hardness, down to a degree of hardness and distension which is very little removed from the normal.

The same is true of the sigmoid flexure. It may sometimes be felt, in cases of well-marked mucous colitis, to be a tube with rigid walls of 1½ in. in diameter, and sometimes with localized irregularities suggestive of contained scybala, but which continued palpation shows to be true muscular hardenings which disappear under the fingers in a way which no scybala could. This condition of hardness and increase in size may vary from this somewhat extreme degree down to one but slightly removed from normal, according to the severity of the agency which is producing the abnormal tone.

The same may also be said of the rectum above Houston's valve; I have felt this portion of the bowel harden up under my finger until it formed a cylindrical tumour of almost cartilaginous hardness and then soften again during examination. Localized hardenings of this or of a lesser degree I find to be of much more frequent occurrence in the rectum of patients suffering from mucous colitis and irritable colon than I imagined before I examined the rectum as frequently as I now do in such cases. As it is only within the last few years that I have detected this hardening of the upper part of the rectum, I cannot speak of a long series of cases of the extreme degree here described, though it is unmistakable in those I have observed. I have met, as yet, only one or two cases of cartilaginous hardening of the valve as described, and only a few of the complete annular hardening of the gut above the valve, but I have seen many cases of partial localized hardening of its wall, and in cases suffering from painful spasmodic contraction of the colon, whether the symptoms be typical of mucous colitis or not, I have frequently found some degree of transient muscular hardening causing the bowel to be palpable as a softish, flattened, fleshy tube of the size of the thumb, or less, instead of being thin walled, as in the normal rectum.

It is evident that the series of phenomena I have just described cannot be explained by means of the acknow-