THE STOMACH AND DUODENUM AFTER OPERATION*

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(With Special Plate)

X-ray examination of the stomach or duodenum which has been the seat of surgical intervention often presents a problem of great difficulty. In the case of the intact stomach the examination is made easy because of the possibility of filling it out to its normal contour. As a rule, however, with the stomach after operation this is not possible, and a wide variety of appearances may present themselves in the absence of any pathological condition. It is the difficulty of disentangling these normal variations from the pathological which constitutes the problem.

Because of the above consideration the radiographic technique must be modified in some respects. Screen examination is even more important than in the intact stomach, and the demonstration of the mucosal relief pattern is of greater value. The technique must be varied according to the precise operation performed, and it is most desirable to have this information before commencing the examination.

A Radiographic Classification

From a radiographic point of view these cases fall into broad classes—those in which sphincteric control of gastric evacuation has been abolished, and those in which it has been retained. Some operations fall between these two groups, as follows:

1. Sphincteric Control Retained.

Simple excision or cauterization of a gastric ulcer.
Wedge resection.
Sleeve resection.
Gastro-gastrostomy.
Duodeno-jejunostomy.

2. Sphincteric Control Partly Retained.

Pyloroplasty.
Schoemaker's operation.
Billroth I.

Although in all these the muscular pyloric sphincter is either cut or removed, yet enough control of efflux is exhibited by the stomach to warrant the above term in classification.

3. Sphincteric Control Abolished.

Gastro-jejunostomy. (Only when abnormal contracture of the stoma has taken place does there occur any degree of control.)
Billroth II.
Polya and its modifications.
Finney's pyloroplasty.

In the first group, with retention of sphincteric control, the technique should be the same as for the intact stomach. Special attention should, however, be paid to the relief pattern, both under the screen and in serial radiograms. The erect, supine, and prone positions are all of value, and the most suitable for taking radiograms will be determined by the fluoroscopic appearances.

In the second group, where partial control has been established, again the normal technique may suffice, but means should be at hand to control the gastric efflux should this prove to be too rapid to allow satisfactory and complete filling of the stomach. Such means are indicated in the succeeding paragraphs.

It is in the third group, with abolition of sphincteric control, that most difficulty occurs. A wide communication exists between the lower part of the stomach and the small intestine, and the gastric contents are rapidly poured out into the jejunum. It is impossible to distend the stomach, or stump of the stomach in gastrectomy, unless the efferent jejunal loop be occluded by pressure. This can be done by hand temporarily under the screen, but this immobilizes the palpating hand, and cannot be kept up indefinitely. Some form of mechanical compressor or truss is much to be preferred.

Mechanical Compressors

A well-known type is the Chaoul compressor. In this a metal ring, 5 inches in diameter, supports a rubber bag, which can be inflated to a hemisphere. It is strapped to the patient's abdomen by an attached broad webbing band and buckle. Pressure on the required area is induced and maintained by the inward bulge of the bag. The objections to it are the difficulty of precise adjustment and the shadow of the metal ring.

Overend has devised an ingenious pressure cone and serial radiographic apparatus for attachment to the screen-holder of an upright stand. Designed primarily to study the relief mucosal pattern of stomach and duodenum, it will serve to control the stoma of a gastro-jejunostomy. Its disadvantage for the latter is the small aperture it possesses, limiting the fluoroscopic and radiographic field.

I have designed an adjustable truss which answers the latter purpose—control of the efferent loop—satisfactorily. It consists of two portions—a leather-covered spring band, similar to that of an ordinary hernia truss, and an adjustable compression pad. Three or more spring bands are necessary, to fit varying sizes of patients. The adjustable pad comprises a base slotted for the reception of one end of the appropriate spring band, an arm hinged on this base giving,

FIG. 1.—Truss compressor.

by means of a small thumbscrew and worm-gear, an anterior and posterior angulation, and a leather-padded aluminium pad. The arm is slotted throughout its length, and the pad can be adjusted along its length by a butterfly-nut. The hinged arm has an upward bend, so that the compression pad is above the level of the spring band when fitted to the patient. This avoids obscuration of the field under examination by the shadow of the spring. Reference to the diagram will indicate the details of the truss. (Fig. 1.)

Examination of Group 3 Cases

The technique for each individual case will vary according to circumstances, but that which I use as a basis is as follows:

The examination is commenced in the erect position, and under fluoroscopic control the patient drinks one mouthful of the opaque cream. This gives a preliminary screen survey of the relief pattern of the stomach, the stoma, and the efferent loop. The truss is then fitted with the spring band just below the iliac crests and the pad over the efferent loop. The patient drinks a few more mouthfuls, and the pressure of the pad is increased by turning the worm-nut till obstruction of the loop is obtained. Sufficient of the meal is then drunk to distend the stomach.

* Read in opening a discussion in the Section of Radiology and Electrotherapeutics at the Annual Meeting of the British Medical Association, Bournemouth, 1934.

Antero-posterior, serial, and left lateral radiograms are now taken and the compressor removed. Removal of the latter is a matter of a few seconds. The rate of emptying of the stomach is then noted fluoroscopically, attention being paid to any tender points over the stomach, duodenum, and stoma. The degree of jejunal overloading, if any, should be noted.

In a minute or two the stomach will, as a rule, have largely emptied itself, and enough of the cream will remain therein to permit a further observance of the mucosal relief pattern in the prone and supine positions. Radiograms may be taken in these positions if necessary.

The patient should again be screened, half or one hour later, to determine the amount of residue in the stomach.

Such is the average technique required in these Group 3 cases, but the study of each case should be individual, and no cast-iron routine should be adopted.

Before considering the normal and pathological appearances after operation it is desirable to outline the nature of each. Some of the operations mentioned above are but rarely performed, and still less frequently seen in an *x*-ray department. For reasons of space these infrequent operations, which have now little more than a historic interest, will not be considered further. Others, such as posterior gastro-jejunostomy and partial gastrectomy, are *très à la mode*, and such patients are frequently referred for *x*-ray investigation.

The group with abolished sphincteric control comprises the majority of operation cases referred for *x*-ray examination, including as it does gastro-jejunostomy and the popular varieties of gastrectomy. Incidentally, it is the most difficult group to examine radiographically.

Gastro-jejunostomy Cases

Posterior No-loop Method.—This is the operation of choice for simple pyloric obstruction and duodenal ulcer, and is probably performed more often than all the other gastric operations together. The essence of it is to form a wide anastomotic opening between the jejunum, as close to the duodeno-jejunal flexure as possible, and the posterior wall of the stomach. The anastomosis must of necessity be made through the posterior layer of the lesser sac. The pylorus is sometimes occluded; this occlusion is often designed to be temporary; by suitable choice of sutures the pylorus will become patent again in six months after the operation. The objects of the operation are to provide free drainage of the stomach, to allow alkaline regurgitation from the jejunum, and to prevent the passage of acid gastric contents over the pyloric or duodenal ulcer. (Fig. 2.)

FIG. 2.—Posterior gastro-jejunostomy.

Normal Radiographic Appearances

In the erect position the prominent feature is the immediate passage of the opaque medium into the jejunum. This occurs as soon as the patient swallows a mouthful or so. No more should be given in the first instance, as the initial study of the relief pattern of the stomach, stoma, and jejunum is important. If the patient then takes the remainder of a 12 to 14 oz. barium meal some fleeting filling of the stomach may take place, but more commonly an irregular partial filling only is achieved, the barium pouring into the efferent loop of the jejunum in a steady stream. The greater curve above the stoma is markedly indented by the mucosal folds. The latter results from the muscular contractility of the stomach. During this stage the stoma itself is hidden in the antero-posterior view.

The pyloric antrum, distal to the stoma, rarely fills to any extent, even if the pylorus has not been occluded

in a case of duodenal ulcer. As a rule, a few irregular streaks of barium are all that are seen in this portion. Exceptionally, it is better filled, and some of the barium cream passes through the pylorus and duodenum, but even then the pyloric antrum is conical, and lacks its normal rounded contours. If the pylorus has been occluded the filling of the pyloric antrum is very poor indeed. The stoma may be seen in profile in a lateral view, but for technical reasons it is generally difficult to obtain a sharp skiagram of it in this position.

The efferent jejunal loop and the coils of jejunum are usually somewhat distended with barium, and a mild permanent dilatation of the upper jejunum is normal. It may be considerable. The feathery appearance resulting from the valvulae conniventes persists, but to a less extent than in the normal, as a result of this dilatation.

As a rule none of the meal passes into the afferent loop via the stoma with the patient in the erect position. Any barium present in it and in the duodenum will have found its way through the pylorus.

The rate of emptying is remarkably rapid, in my experience. Various authorities have given the time for complete emptying as from one to two hours, and even more. These figures may be true if by "emptying" is meant the complete evacuation of every trace of barium from the stomach, but not if the main mass of barium is referred to. The main bulk of the opaque meal may have passed out into the jejunum in from ten to fifteen minutes, and yet traces of barium remain entangled in the mucosal folds for an hour or two (especially in the folds of the pyloric antrum). Disregarding these entangled residues, the stomach is empty in from seven to thirty minutes if the stoma be of average size. With a large stoma these limits are shortened, and with a small one they are increased.

The rate of emptying of the stomach is modified by posture. In the supine position a pool in the fundus may remain for a time, being there below the level of the stoma. No lengthy stasis occurs, however, as the contractile tonus of the stomach gradually empties it. As the stomach empties its contents, the mucosal pattern of and around the stoma again makes its appearance, and may again be studied fluoroscopically. Tenderness on pressure over the stoma and elsewhere is an important diagnostic feature, and careful search for such tender points should always be made.

If the stomach before the operation was grossly dilated and atonic, and its muscle coats too atrophied to be restored to the normal, the radiographic picture after gastro-jejunostomy will be somewhat modified. Some dilatation will remain, the indentations of the greater curve will be less, and there will be a tendency to pool formation in the pyloric antrum below the stoma. The main mass of the barium cream will, however, pass rapidly into the jejunum.

Pressure Control of the Efferent Loop

It is obvious from the normal appearances without control that the demonstration of recurrent duodenal, pyloric, or lesser curve ulcer may be difficult on account of incomplete filling of the stomach. Efficient obstruction of this loop enables the contrast medium to be dammed back in the stomach and a study of these portions to be made.

Using an apparatus such as is described above, the lesser curve can be examined in its entirety. The pre-pyloric region is sometimes filled to its normal contours, but more frequently remains to some degree contracted and conical. If the pyloric canal be not obstructed or occluded the meal can be forced through it into the duodenal bulb. It is of importance here to know beforehand whether the pylorus was occluded at the operation

or whether it was already stenosed. The duodenal bulb does not usually fill out to normal contours, partly because it is difficult to force a sufficiently large amount of barium through the pylorus at a time, and partly because some scarring of the bulb may persist after the healing of a duodenal ulcer.

Complications after Posterior Gastro-jejunostomy

Ryle has grouped the complications after gastro-jejunostomy and partial gastrectomy as follows, in ascending order of gravity:

1. Dumping stoma.
3. Vicious cycle.
3. Perianastomotic gastritis and its ulcerative complications.
4. Achylic anaemia.

Groups 2 and 3 tend to be intermingled in actual practice, vicious cycle often being the result of an ulceration and cicatrization falling into Group 3. Again, Ryle's grouping does not include recurrent ulceration of the lesser curve or duodenum, or gastric carcinoma. With the exception of achylic anaemia, these complications can usually be demonstrated radiographically.

Jejunal Dumping (overloading of the jejunal loop).—If the stoma be very large the flooding of the jejunum is exaggerated, and the stomach may empty into it in from two to three minutes. The patient experiences a dragging fullness and discomfort immediately after food, and the jejunum is seen to be distended and overloaded temporarily. Dietetic indiscretions, either of quality or of quantity, increase the patient's discomfort. It is reasonable to explain the symptom-complex on these mechanical grounds. To what extent jejunal overloading contributes to the development of jejunal ulcer is a moot point, and one difficult to put to the test. Possibly if much gastric hyperacidity be present it may have some effect.

Recurrent Ulceration.—This may be gastric, pyloric, duodenal, gastro-jejunal, or jejunal in site.

1. **Recurrent lesser curve ulcer** is, as a rule, easily demonstrated if the stomach be reasonably well filled by controlling the efferent loop. A niche will be visible, and on the greater curve a localized exaggeration of the notching which is usually present.

2. **Recurrent duodenal ulcer** presents a more difficult problem—even more difficult than in the case of a duodenal ulcer which has recurred after medical treatment. In the latter only the deformity due to scarring has to be discounted. After jejunostomy, however, the further disturbing factor of incomplete filling of the cap must be taken into account. In some cases the actual ulcer crater may be seen, but more frequently only some general deformity of the duodenal bulb is present. If the jejunum has been satisfactorily occluded by a truss, and food is passing freely through the pylorus, the second disturbing factor can be excluded, and the problem becomes that already described under the section of duodenal ulcer.

3. **Gastro-jejunal Ulcer.**—As the stoma on the posterior wall is hidden in the antero-posterior view an ulcer will show only in a relief pattern radiogram. If it be large it may be visible in profile in a lateral view. Owing to the normal irregularity in the contours in a healthy stoma care must be used in diagnosing an ulcer crater from a projection above. Further confirmatory signs may help. The most important of these is pain on pressure, localized over the stoma. In the present state of our technique persistent tenderness on pressure is probably the most reliable sign of a stomal or jejunal ulcer. Another sign of value is a persistent residue in the ulcer crater. Such a residue must, however, be differentiated from flecks

entangled in the mucosal folds in this region. An ulcer situated in the region of the stoma may, by spasm *plus* scarring, cause stenosis of the stoma itself, with gastric stasis; stenosis of the opening of the proximal loop, with the development of duodenal ileus if the pylorus is patent; or stenosis of the distal loop, again causing duodenal ileus, if the proximal be patent.

4. **Jejunal Ulcer.**—If this be close to the stoma the above remarks will apply. If it occurs below the level of the greater curve there is more chance of the ulcer crater being outlined at some stage of the examination. Again care must be taken not to mistake a fleck of barium entangled in the mucosa for a barium-filled crater. The larger, the denser, and the more persistent a residue, the more likely it is to be an ulcer crater. Localized tenderness to pressure of one finger over the residue is an important confirmatory sign. The valvulae conniventes seen in relief pattern converge to, and are interrupted by, the crater, an appearance best seen if the latter is on the anterior or posterior wall, and so viewed *en face*. Some spastic contraction of the circular fibres in the ulcerated segment may occur and be visible.

Jejunitis.—Occasionally the valvulae conniventes of the efferent loop are thickened and their feathery character lost—an indication of a jejunitis.

Narrowing of the Stoma.—The usual surgical practice nowadays is to make a wide stoma to allow for gradual contraction. If this contraction is greater than usual the rate of gastric evacuation is slowed. To what extent this narrowing and consequent slowing is disadvantageous is a matter of doubt. The wide stoma, while it achieves its results so far as drainage is concerned, alters the normal physiological processes profoundly, and frequently causes jejunal overloading. Narrowing of the stoma sufficient to slow the rate of emptying of the stomach to between one and one and a half hours is probably not undesirable, but retention in the stomach up to two, three, or more hours should be regarded as a sequela likely to defeat the objects of the operation. In such cases the stenosis of the stoma cannot be demonstrated directly. Its presence can be deduced only by the slow rate of emptying.

Malposition of the Stoma.—If the stoma be made too high, stasis of gastric secretion may occur in the pars pylorica, in the erect position, and be a factor in the recurrence or persistence of a peptic ulcer. The position of the stoma can be accurately demonstrated in a lateral view or a relief antero-posterior one.

Duodenal Ileus.—This, too, may result in a minor degree from a high stoma, especially if a visceroptosis of some degree be present. In such case, if the duodenum and duodeno-jejunal flexure be ptosed below the level of the stoma, the stomach may empty itself partly into the efferent jejunal loop, and so into the duodenum. This sequence of events is visible fluoroscopically. On the patient swallowing a mouthful of barium some is seen to pass into each loop of the jejunum, that going into the afferent collecting in a pool in the dependent part of the dilated duodenum. This is seen only in the erect position. The supine or prone position removes the static factor which is the essence of the abnormality. Duodeno-jejunostomy is the appropriate treatment.

Anterior Gastro-jejunostomy

In this a long loop of jejunum is brought up in front of the transverse colon and anastomosed to the anterior gastric wall. It is performed, *faute de mieux*, when a gastro-enterostomy is essential and it is technically impossible to adopt the posterior method. The stoma is made as near as possible to the pylorus and greater curve, and its axis should run from above downward and to the

right. Because of the serious risk of stasis in the long afferent loop, about eighteen inches in length as a rule, an additional jejuno-jejunostomy is frequently made between the two loops. (Fig. 3.)

FIG. 3.—Anterior gastro-jejunostomy.

The other untoward sequelae of anterior gastro-jejunostomy are similar to those in the posterior method.

Billroth II Partial Gastrectomy

In the past a popular operation for carcinoma of the stomach, or large chronic ulcers in the region of the lesser curve, this is to some extent being superseded by the Polya types of gastrectomy. It consists of segmental resection of the stomach, including the pyloric canal, closure of both ends, and posterior gastro-jejunostomy. (Fig. 4.)

FIG. 4.—Billroth II.

Radiographically the stomach behaves similarly to the jejunostomized stomach, save that the pyloric antrum is absent. At first the gastric stump is small, but later it enlarges somewhat. This dilatation is not marked unless contracture of the stoma takes place. The right blind extremity of the stomach assumes a rounded, slightly puckered contour. The stump can best be seen if the efferent jejunal loop be obstructed by a truss. Only then can the stump be properly filled and its contours studied.

Normally there is no reflux from the stomach into the afferent loop and duodenum. But efficient obstruction, by a truss, of the efferent loop will cause such reflux, an appearance which must not be mistaken for a vicious circle. It disappears on removal of the truss.

After-results

Recurrent gastric, stomal, or jejunal ulcer is less common than in gastro-jejunostomy, as a considerable proportion of the acid-producing mucosa is removed by the operation. The more complete the gastrectomy the less chance of recurrent peptic ulcer. As, however, this operation does not allow of a very wide resection, recurrent ulceration does occasionally occur, and its radiographic demonstration and appearances are similar to those in gastro-jejunostomy.

In cases of carcinoma ventriculi local recurrence of the growth is not uncommonly met with. Depending on the precise site of the recurrence, there may result:

1. Obstruction of the whole stoma.—This causes dilatation of the fundus and oesophagus, and, clinically, vomiting and rapid starvation. The nature of the condition is clearly visible on fluoroscopy, and the details of the gastric filling defect in serial radiograms. Discounting the distortion due to the suture line, a recurrence causing the above interference with the stoma usually presents a constant filling defect, which is fairly characteristic.

2. Obstruction of the efferent loop alone.—The stomach will present similar appearances, but in addition the duodenum will be in a state of ileus, and be outlined by the barium cream passing from the afferent limb into it.

3. Obstruction of the afferent loop alone.—Again a duodenal ileus results, but as no barium can pass into it, it will be demonstrable radiographically only if it contains gas.

The Polya Operation

Polya-Moynihan.—This modification of the original Polya operation is probably more frequently adopted in this country than any other form of partial gastrectomy. It consists of a segmental resection of the lesion-bearing portion of the stomach, including the pylorus, as in the Billroth II, with end-to-side anastomosis of the gastric stump to a loop of jejunum. In the original Polya the jejunum was brought up through a fenestra in the transverse mesocolon. This has the disadvantage, in cases of carcinoma, that a recurrence, apt to take place near the fenestra, may cause obstruction of the jejunum. This is avoided by the Moynihan modification, in which a loop of jejunum is carried up in front of the transverse colon. The diagram indicates the direction of the jejunal current (from left

FIG. 5.—Polya-Moynihan.

to right). The loop is chosen as near to the duodeno-jejunal flexure as possible, allowing enough length in the afferent limb to prevent any possibility of tension on it when the patient assumes the erect position. (Fig. 5.)

Polya-Balfour Operation.—In Balfour's modification the long jejunal loop is used, and the jejunal current is in the

FIG. 6.—Polya-Balfour.

reverse direction to that in the Polya-Moynihan operation. In order to prevent stasis in the proximal limb a lateral anastomosis is made between the two limbs of the loop. (Fig. 6.)

Modified Polya, with entero-anastomosis en Y.—In this modification a segmental resection is made as before. A jejunal loop is brought up as in the Polya-Balfour, but is divided across. The cut end of the distal limb is closed

FIG. 7.—Modified Polya: anastomosis en Y.

and that limb anastomosed side-to-end with the gastric stump. The proximal jejunal limb is then anastomosed end-to-side with the distal limb an inch or two below the gastric anastomosis. (Fig. 7.)

Polya: Lake's Modification.—This modification, judging by the radiographic appearance, controls the efflux of the gastric contents better than any other of the Polya type. In addition to preventing "dumping" into the jejunum, it renders reflux into the afferent loop very improbable. In it a short jejunal loop is brought up through the

FIG. 8.—Polya: Lake's modification.

transverse mesocolon, the jejunal current flowing from right to left. Although the jejunal loop is sutured along the whole length of the cut gastric stump, only a small stoma, about $1\frac{1}{2}$ inches in length, is made at the lower end. (Fig. 8.)

X-Ray Appearances in Polya-Moynihan Type of Partial Gastrectomy

With the Polya-Moynihan the gastric stump is, as a rule, smaller than in the Billroth II operation, and the anastomosis is seen to be terminal. To study the full contours of the stump control of the efferent loop will be necessary, but this should be preceded by observation of the normal emptying, (that is, without control). Under the screen careful note should be made of the efflux into the jejunum. The barium should be seen to pass chiefly into the efferent limb, at the right of the stump. Some will pass into the left, or afferent limb, but this should not be excessive.

With control of the efferent limb the fundus of the stomach should fill out to a normal contour, and there may be some oesophageal reflux. The afferent jejunal limb will fill more definitely, and active peristalsis will be seen as this loop endeavours to empty itself. The contours in the region of the anastomosis vary considerably, depending on the precise position of the sutures. A certain amount of puckering is to be expected.

The stomach, after this operation, empties very rapidly; by the time the patient has finished drinking a 12-oz. meal most of it will be in the jejunum, and mild jejunal overloading is a common effect of rapid ingestion. Occasionally it may be marked, causing a sensation of fullness and dragging in the abdomen. It is therefore important that a patient should masticate thoroughly, and eat and drink slowly, after having been subjected to this type of operation.

Abnormal After-results

Recurrent Peptic Ulcer.—This, an uncommon sequela, may be gastric, stomal, or jejunal in site. The more complete the gastrectomy the rarer is such a complication. Recurrent gastric ulcer may be on the lesser curve, when it will show as a niche, or on the posterior wall. In the latter case a relief picture is the best means of demonstrating it. Stomal ulcer is more easily demonstrable after the Polya type of operation, as the stoma is terminal relative to the stomach. As with other forms of stoma, residues entangled in puckered mucosa must be differentiated from a barium-filled ulcer crater. The latter are more constant in a series of pictures, and, if the ulcer be deep, denser from sedimentation therein. Tenderness on localized pressure over the suspected shadow is an important confirmatory sign. Jejunal ulcer is more readily visible than in cases of gastro-enterostomy, as the gastric shadow is not superimposed on the juxtastomal portion.

Overloading of the Proximal Limb.—This rarely occurs in the Polya-Moynihan operation if the afferent jejunal limb be short and the axis of the stoma properly planned, but with a vertically disposed stoma and an unduly long limb some stasis and ileus may be seen. It does, however, occur in:

Recurrent carcinoma, if the efferent limb be obstructed by the recurrence. Clinically, such cases present characteristic features—inability to eat or drink any but small amounts, persistent vomiting, epigastric pain, and wasting. Radiographically, a gastric filling defect near the efferent stoma may be present. Oesophageal reflux and dilatation may occur, and the meal is seen to distend the afferent limb. The rate of gastric evacuation is slow, unless by vomiting. Recurrent carcinoma of the gastric stump itself is apt to cause stenosis at or just above the stoma. Clinically the symptoms are as above described, and radiographically a considerable filling defect of the stump will be apparent. Scarring from recurrent simple ulceration may also cause obstruction of either stoma—efferent or afferent—with similar appearances to those in the carcinomatous variety, save there will not be present a gross filling defect of the stump itself.

X-Ray Appearances in Polya-Balfour, Polya-en-Y, and Polya-Lake Operations

The appearances will vary from those above described chiefly in the site of the efferent jejunal limb, which is situated at the left angle of the stump. In the Balfour modification some barium may pass into the afferent loop, but this can cause no trouble, because of the jejuno-jejunostomy below. In the en-Y type, again, no overloading of the afferent limb can occur. With these exceptions the abnormal after-effects are similar to those described in the case of the Polya-Moynihan.

In the Polya-Lake operation the gastric stump fills reasonably well in the erect position, and the stoma is clearly seen at the lower pole. The right border of the stump is formed by the remaining portion of the lesser curve and the sutured end of the stump above the stoma. This largely loses its initial angularity, and becomes more or less straightened out. At the junction of the two there is apt to remain a dimple, which must not be mistaken for a recurrent lesser curve ulcer.

Complete Gastrectomy

Complete gastrectomy (Moynihan) is a difficult operation technically, and attended by an appreciable immediate mortality. It is indicated in some cases of gross scirrhus carcinoma of the leather-bottle type. It consists of resection of the whole stomach, and end-in-side, or side-to-side, anastomosis of the lower end of the oesophagus with a high loop of jejunum. The latter is brought up through a fenestra in the transverse mesocolon. The two limbs of the jejunum may be anastomosed lower down to short-circuit the bile and pancreatic secretions.

X-Ray Appearances after Complete Gastrectomy

If examined a few weeks after operation the meal will be seen to pass rapidly down through the stoma into the coils of jejunum. Even at this stage there may be evident some dilatation of the jejunal loop close to the stoma.

Butler¹ has described the appearances in a case six months after complete gastrectomy. The feature in it was a considerable dilatation of the jejunum close to the oesophageal stoma. The dilated portion was ballooned into the left dome of the diaphragm, contained a gas bubble, and simulated the fundus of a normal stomach. Doubtless the constant upward pressure of gas in this loop contributed to this effect. Barium remained in this dilated pseudo-fundus for more than five minutes. At the end of an hour all the barium had accumulated in the pelvic coils of the ileum. Transit is therefore rapid, as in the partial gastrectomy cases.

REFERENCE

- ¹ *Brit. Journ. Surg.*, 1927, xv, 38, 316.

THE RELATIVE ADVANTAGES OF BRITISH AND FOREIGN HEALTH RESORTS*

BY

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The British Health Resorts Association broadly classifies health resorts into: (1) spas, (2) resorts at the seaside, and (3) resorts inland. In all cases climate must be considered important from the point of view of health, using the word climate in a wide sense to include not only the air with its temperature, moisture, and movement, but sunlight and more intangible influences which may arise from running water, vegetation, and animal life, and which affect our spirits as well as our bodies.† While inland health resorts rely entirely on these factors, those at the seaside and spas have the sea and natural waters as additional agents for the promotion of health.

In a comparison of British and foreign health resorts it is wise to consider the people who go to them. By far the largest number of visitors are the holiday makers,

who have no thought of health, but who look for a pleasant place with a "change of air" and plenty to do. With these people we are not concerned at all. A second group consists of those who, in the main, are out for a holiday, but who wish to take some medical treatment as well. For instance, the man who overeats all through the year takes a cure during his holiday in order to go through the round once again. These people have money to spare, and may prefer a foreign spa, since the change in their surroundings will be the greater. Nor can there be any objection, since this country receives numerous visitors from America, and America must receive an equivalent in imports and services from the Continent. It was quite different in 1932 when the British Health Resorts Association was founded; that was a time of temporary danger, and English people were asked to stay in their own country. A third group consists of those who visit a health resort purely for the sake of their health.

Health resorts, so far as they contain up-to-date installations, can provide all those general physical methods of treatment that can be obtained in London or in other large centres—for example, douches, steam and paraffin-wax baths, diathermy, etc. All the larger spas, British and foreign, are alike in this respect. In fact, until quite recently, these general methods of treatment were administered more effectively at a spa than in London, although there is no reason why this should have been the case, since all towns nowadays have water and an electricity supply.

Climate

Climate is generally described as "tonic" or "bracing," and on the other hand as "relaxing," or, if this word has unpleasant associations, as "sedative." From the point of view of clear thinking the use of these words might well be discontinued. A "bracing" climate can only mean a climate of marked cooling power. Leonard Hill's observations with his kata-thermometer show that cooling power depends on three factors: temperature, humidity, and the movement of air. Hence a bracing climate must mean one possessing a cool, dry, breezy atmosphere, while a relaxing atmosphere will be hot, moist, and still. British spas, with the possible exception of Bath, belong to the former category, and this is an advantage, because at the end of the cure the patient can go straight back to his ordinary occupation. The same is not the case with a relaxing climate. For instance, a patient of mine described a previous visit of hers to Salso Maggiore as extremely tiring, and she had to go to the mountains in Switzerland before returning to England; this is the "Nach-kur" of the Germans.

British seaside resorts have a wonderful variety of climate. In the South-West they approximate to the French and Italian Riviera, but as there are usually more clouds in the sky the fall in temperature at night is less marked; the days are not so hot and the nights are not so cold. The resorts in the East and North-West are cool, while those in the South-East may be regarded as intermediate. Full details are given in the handbook of the British Health Resorts Association.

Physiological Effects of Mountain Climate

England possesses no mountain climate, and if such is required patients must go to Switzerland, or further afield to the High Tatra in the Carpathians. It is claimed that clinically the moorland climate in the North is equivalent to a mountain climate. A valuable summary of the physiological effects of a mountain climate (not applicable to any English resort) was communicated by Professor A. Loewy to the International Society of Medical Hydrology at its annual meeting this year in Switzerland. The action of such a climate is due to the reduced

* Read in opening a discussion in the Section of Balneology and Climatology at the Annual Meeting of the British Medical Association, Bournemouth, 1934.

† It is advisable not to be too sceptical in these matters. I need only allude to the recent correspondence in *The Times* on water divining and on the important experiments carried out last year by Dr. Lintott in the Physiological Department of Guy's Hospital. He found that water running beneath the subject produced an increase of tone in the muscles with corresponding rise in the twig or other apparatus used; and that this effect was not abolished by electrical insulation of the body, but that it was necessary for the subject to throw the muscles of the arms and legs voluntarily into tension. Thus the results were not obtained when the subject walked on a smooth surface such as glass, since there was no purchase for the legs. May not these obscure influences have some medical bearing in the future? We read that water divining continued through the afternoon produced a headache!

S. COCHRANE SHANKS: THE STOMACH AND DUODENUM AFTER OPERATION

FIG. I.—Male (60), 21/9/33. Normal x-ray appearance after Polya-Lake. Note satisfactory control of efflux.

FIG. II.—Male (21), 17/10/33. Normal x-ray appearance after gastro-jejunostomy for duodenal ulcer in 1929.

FIG. III.—Male (49), 15/12/32. Polya-Lake in September, 1931, for scirrhus carcinoma. Recurrence obstructing the efferent limb of the jejunal loop. Duodeno-jejunal ileus results.

FIG. IV.—Male (47), 12/1/33. Gastro-jejunostomy for duodenal ulcer in 1912. Symptoms recurred in two years. X-ray examination shows large jejunal ulcer.

FIG. V.—Male (45), 18/12/33. Gastro-jejunostomy for gastric ulcer in 1913. Laparotomy in September, 1933, for jejunal ulcer. Anastomosis undone. Barium meal shows the stoma to be closed, gross irregularity of the pyloric antrum and duodenal bulb, and a duodenal ileus.

FIG. VI.—Male (40), 13/6/34. Posterior gastro-jejunostomy complicated by peri-anastomotic gastritis. Slight stomal stenosis and well-marked jejunitis.