

tack, may be and often is sudden, has a very limited field of radiation, may be irregular as to time of separate attacks, but regular as to the taking of food. It is dependent on food, being early eased, and later pain returns. The history of gas, vomiting and acidity runs parallel to the periods of pain. No spasm of the diaphragm occurs except in some cases of perforation. The vomiting and belching are usually decided in quantity and quality and followed by relief.

There will always remain a certain proportion of cases that will mislead the careful physician. Those gallstones where the stomach symptoms of gas distress, sour belching and dilatation predominate, and pain is but little complained of (and that only of a dull character), will usually be diagnosed as ulcer; where the duodenal case whose chief symptom is the sudden, sharp, intense pain of perforative but localized peritonitis, and where, with no obstruction and hyperacidity, the other stomach symptoms are in abeyance, will fall to cholelithiasis. Such error in diagnosis does not militate against the clinician, as both conditions are purely surgical and the differentiation in many cases must be made on the operating table.

TREATMENT.

In the acute ulcer or erosion of young anemic females, manifested by slight bleeding usually, the well-known dietetic treatment yields very satisfactory results. In the indurated or chronic ulcer which is prone to perforation in middle life and more frequently in men, medicinal treatment is very disappointing in the permanence of cure. It is to this class of persistent sufferers, where relapses have occurred and where the pain and discomfort interfere with the conduct of life, that operation has been so brilliant. This is especially true in pyloric or duodenal obstruction, even though the ulcer is healed.

Surgery should be kept strictly within the limits of a mechanical appliance. It can not be asked to act in any miraculous or mysterious way. The indication is solely for better drainage of the stomach, and at a point where the food and acidity will not have to pass over and irritate the ulcer. It is the old principle of rest. The operation which accomplishes this best is posterior gastroenterostomy without a loop and the incision in the stomach being from right to left, as recently devised by Mayo. Theoretically, also, it is a good thing absolutely to obstruct the pylorus and thus give the ulcer immunity. This can be done in connection with gastroenterostomy by cutting through the pylorus and closing each end by suture or by surrounding it with a moderately tight construction of silver wire (Fowler). This would stop the food current, but not cut off the circulation. Practically, however, this step is rarely employed by the masters who have perfected this work.

THE HOUR-GLASS DUODENUM.

A PLEA FOR A MORE EXTENDED USE OF PLASTIC SURGERY TO PRESERVE THE DUODENAL ROUTE.*

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Only the most casual reference is made in literature to the deformities of the duodenum, and when the pyloric end of the stomach is the seat of intrinsic obstructive disorders the pylorus is almost invariably referred to as the seat of the obstructing cause.

In these later days of gastric surgery there is evident a growing sense of appreciation of the important rôle played by the duodenal ulcer in causing obstructive disorders of the stomach, and more critical analysis of

the distribution of the so-called peptic ulcer tends to demonstrate an increasing ratio of duodenal ulcers. The tardy discovery of this fact is easily explained by the vaguely defined symptom-complex of the duodenal ulcer. During the last eight years I have operated on four cases of the so-called acute abdomen and discovered perforated duodenal ulcers.

In all these cases but one, the most careful canvass of the personal history failed to reveal any sign or symptom of the disease in question, and the one patient noted as an exception complained only of constant pain in the back and six or eight

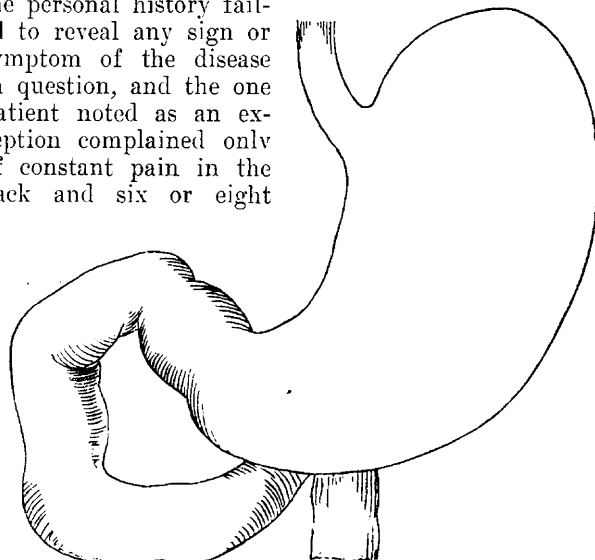


Fig. 1.—Showing normal outlines of stomach and duodenum.

years previously had one attack of melena. All these patients died. The fact is merely mentioned as an index of a larger range of cases than is commonly supposed to exist, and gives mute testimony to the value of more careful clinical study and its corollary, an earlier resort to surgery.

In a statistical review of the incidence of gastric and duodenal ulcers in the service of St. Mary's Hospital, Rochester, Dr. W. Mayo,¹ in a paper read at the Portland session of the American Medical As-

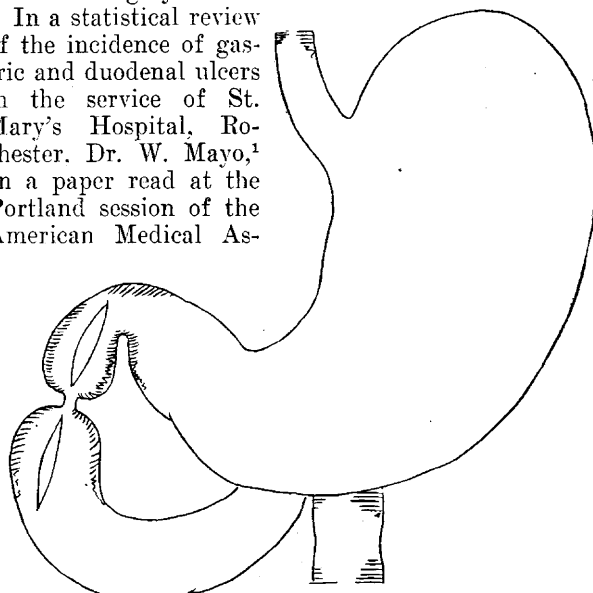


Fig. 2.—Showing feasibility of duodenoduodenostomy to preserve duodenal route.

sociation, made the following observations. For convenience I quote his own words:

We have thought it wise to narrow the limits of the study to the consideration of only the last two and a half years, from Jan. 1, 1903, to July 1, 1905, and also to consider only the cases subjected to gastrojejunostomy, excluding all the ulcers

* Read in the Section on Surgery and Anatomy of the American Medical Association, at the Fifty-seventh Annual Session, June, 1906.

1. THE JOURNAL A. M. A., Oct. 21, 1905.

excised or subjected to Finney's operation, pyloroplasty, etc.

This gives us 231 cases, 119 males and 112 females, of which 115 were gastric ulcers, 60 duodenal, and 14 duodenal and gastric. Twenty of the duodenal ulcers extended up to and involved the pylorus. In other words, out of 231 gastric and duodenal ulcers the duodenum was involved 74 times, 58 times in males and only 19 times in females. The percentage of duodenal ulcers being 32.

According to the observations of Perry and Shaw, the most frequent situation of the duodenal ulcer is the upper horizontal segment of the duodenum. Distribution being as follows: 123 in first segment, 16 in the second segment, 2 in the third segment. Oppenheimer's figures are 69 in the first segment, 8 in the second segment, 4 in the third segment. Collin's estimates are as follows: 242 in the first segment, 14 in the second segment, and 6 in the third segment. Collin states that in 162 cases of this group the ulcers were from two to four centimeters from the pylorus, in 74 cases close to it, in 4 they reached into the pylorus, while in 2 half of the ulcer lay in the stomach and half in the pylorus.

Krause observes that when the ulcers were situated in the upper horizontal segment in 38 cases 15 were in the anterior or right wall, 6 in the posterior or left wall, and 8 in the upper and 9 in the lower wall. Oppenheimer gives the relation of the right to the left or anterior to posterior wall as 18 to 16. According to Boas, the

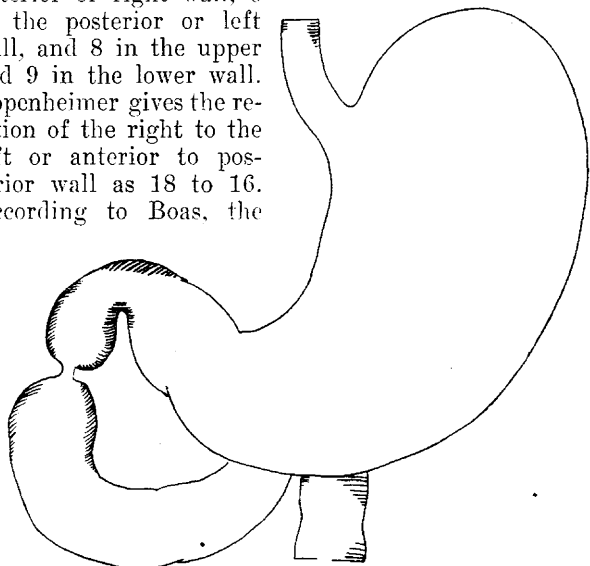


Fig. 3.—Showing one type of hour-glass duodenum due to duodenal ulcer.

ulcers were found more frequently in the inner wall near the papilla.

Pagenstecher states that the duodenum has only in rare cases a mesentery proper on which it lies free. Both cases of hour-glass contraction, which I shall refer to in this paper, had free, movable mesenteries. In the third segment, fixation to the abdominal wall is more constant, the anterior wall only being free.

Quoting Brunner: "The situation of the duodenal ulcer shows relatively the same relation to the duodenum that the peptic ulcer does to the stomach." In 62 ulcers affecting the upper horizontal portion of the duodenum the anterior wall was affected 38 times, the posterior wall 9 times, and the inferior wall 15 times.

All authorities are agreed that the duodenal ulcers are more prevalent among males than females.

In the contemplation of surgical measures for the relief of intrinsic obstructive disorders of the pylorus and duodenum the teaching of physiology should receive the most thoughtful consideration of the surgeon, and it should be laid down as axiomatic that the duodenal route should be selected in all cases in which it is possible.

A review of the physiologic reasons for the selection of the duodenal route will not offend the senses of an assembly of surgeons who, if true to the traditions of their profession, will always hail with approval the finger posts of physiology and anatomy.

It would appear of most vital consequence to the health and well being of all individuals that the food that enters the stomach should cross the pyloric threshold and traverse the entire length of the duodenum. The course is short, but a quick review of the events that succeed one another in the duodenal cycle of digestion carries with it logic that is almost irresistible.²

The following findings are taken from a recent article by Cannon:²

The food enters the stomach and is gathered in the cardia which acts as a reservoir. . . . The gastric peristaltic wave is confined to the pyloric portion which acts as a mill, churning the food and propelling the chyme by jets through the pyloric orifice. . . . The cardia possesses a selective function and retains the proteids long enough to receive their proper treatment by the pepsin ferment and hydrochloric acid, while the carbohydrates are forwarded quickly and without delay into the duodenum, to be treated by their respective ferments.

Free acid in the stomach is the signal for relaxation of the pyloric sphincter. The pylorus opens and the acid chyme passes into the duodenum. . . . The presence of the acid chyme in

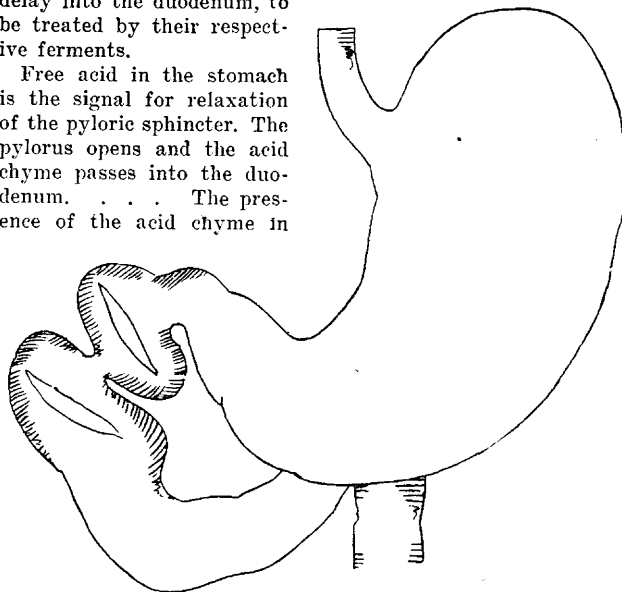


Fig. 4.—Showing another type of hour-glass duodenum with decided duodenal pouch, illustrating proposed plastic operation for its relief; duodenoduodenostomy.

the duodenum is the signal for the pylorus to close and the pylorus remains closed until the acid chyme is neutralized by the alkaline pancreatic secretion.

The transit of certain foods, and certain foods only, across the duodenum excites the flow of bile. . . . The bile flow excites the pancreatic enzymes and generates the fat-splitting ferment which possesses three-fold strength in the presence of bile. . . . The bile stops the action of the pepsin which is destructive to the action of the pancreatic ferments.

The presence of acid foods in the duodenum closes the pylorus and originates the segmenting movements in the small intestine and especially in the duodenum, which mingles the food with the pancreatic and biliary juices and initiates the work of active absorption.

These are the common truths of physiology, established beyond peradventure by the most refined experiments in foreign and domestic laboratories.

The question naturally suggests itself, Does modern surgery in the gastric field obey the behests of modern physiologic dogma, or are they more honored in the breach than the observance? Can the highly organized,

2. American Jour. of Med. Sciences, April, 1906.

vital and complex functions of the duodenum be safely ignored in any operation in this field? Is the substitution of the jejunal for the duodenal route fraught with mischief or do adjustments take place after gastroenterostomy so that the digestive cycle of the duodenum continues despite the duodenal cut-off? It would appear from the most elementary reasoning that any operative measure that cuts out the duodenum from its special rôle in the digestive act possesses serious drawbacks and disadvantages (Fig. 1).

Personal observation of many cases of gastroenterostomy convinces me that a very considerable number of cases suffer afterward from various disorders and that their sufferings do not commonly diminish with time. It is admitted, of course, that in many instances the last condition of these patients is infinitely better than that which first demanded the measures of relief offered, and that it is very often the only recourse left for the surgeon. They are by no means doomed, but they are often marked and in the deep seams of their faces will often be found the anastomotic line. It is far from my thoughts to diminish the halo of splendor that surrounds the achievements of surgery in this fertile field of work.

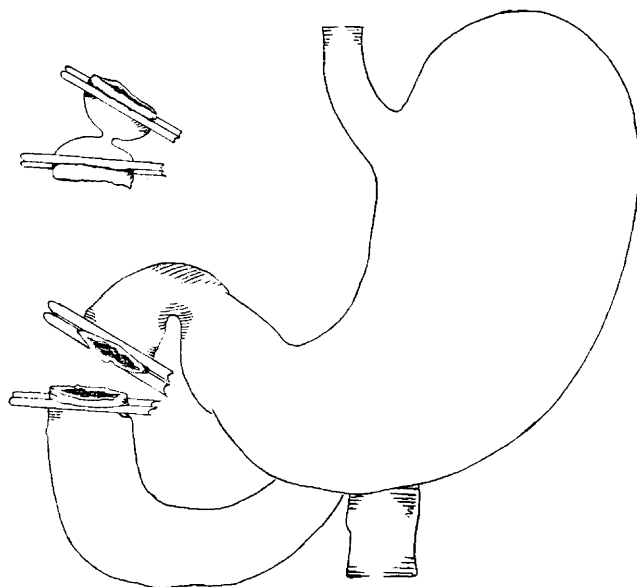


Fig. 5.—Showing feasibility of partial duodenectomy, followed by duodenorrhaphy to preserve duodenal route.

This argument leads me to make a special plea for the expansion of plastic surgery in order to preserve intact the duodenal route for the following reasons: First, the peritoneal investments and the liberal circulation of the parts make it an ideal field for plastic surgery; second, plastic surgery aimed to maintain intact the duodenal route will always furnish the best results; third, plastic surgery in the region of the stomach and duodenum for the relief of stenosis has not yet been sufficiently exploited and has not been accorded its due place in surgery; fourth, the best outlet for drainage of the stomach under all circumstances is furnished by the pylorus and the duodenal route; fifth, plastic surgery permits regional inspection, aids diagnosis and guides the surgeon in the performance of the most conservative work (Fig. 2).

The title of this paper was not selected because it fits the theme, but because the study of two cases in which the hour-glass contraction of the duodenum was first discovered by me suggested it.

Very recently two cases of hour-glass contraction of the duodenum came under my observation in my service in St. Vincent's Hospital, Portland, Oregon. I had never seen a case of this kind before, and I have been unable to find anything in the literature corresponding to it.

CASE 1.—This patient I have observed personally for nearly twenty-five years. Dr. Bevan, if I remember rightly, saw the man in consultation with me fifteen years ago.

Patient.—Male, aged 66. He has a long history of acid dyspeptic, digestive pain, and on six or eight occasions severe hematemesis. Diagnosis was made of peptic ulcer. He was passed from hand to hand and was cured by diet and drugs a great many times.

Present Illness.—I met him on the street recently and he presented a picture of extreme marasmus, without cachexia. There was no pain, but every two or three days he evacuated his stomach of gallons of grumous fluid.

Examination.—This revealed gastrectasis, extending to the iliac crest. The outline of the stomach was visible through his attenuated abdominal wall. No tumor.

Operation.—Operation was advised and performed Feb. 28, 1906, at St. Vincent's Hospital. Section revealed a most perfect type of hour-glass contraction, faithfully portrayed in Figure 3. The duodenum was freely movable, free from adhesions and possessed a free mesentery. There was a small pyloric pouch. Pyloric ring was normal and there was no sign of ulcer of the stomach, past or present.

Posterior gastroenteros-

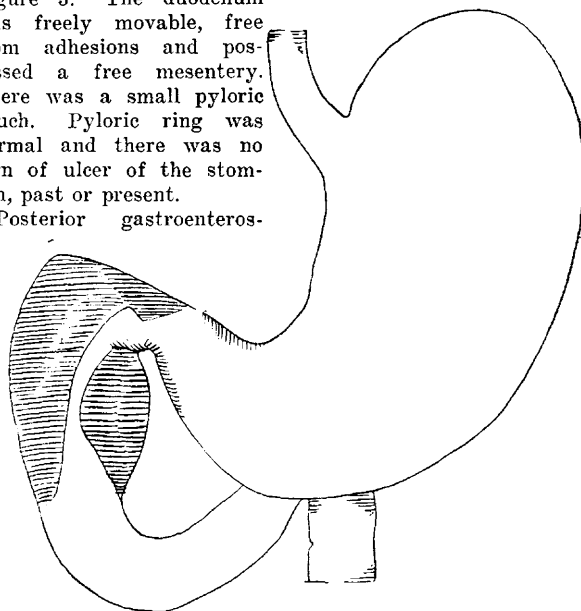


Fig. 6.—Illustrating pyloric and duodenal thickening (benign), result of chronic duodenal ulcer, relieved completely and permanently by duodenoplasty. Note open pyloric ring.

tomy, following method of Mayo, was done. The patient recovered, returned to his home on the eighth day, and was downstairs on the tenth. Results were extremely satisfactory. The remaining signs are so slight as to be insignificant, but enough to make him conscious of the possession of a stomach.

CASE 2.—German, aged 58.

History.—This man complained of gastric misery, vomiting, melena on two occasions and hyperchlorhydria extending over a period of fifteen years. Aspect was anemic, but was not cachectic.

Operation.—Abdominal section revealed duodenal stenosis about one and one-half inches from the pylorus. The pyloric ring was free and patulous. There were a few adhesions about the duodenum. There was hour-glass contraction, with large duodenal pouch on the proximal side (Fig. 4), capable of containing at least one ounce of fluid. For want of proper clamps I had to do free-hand posterior gastroenterostomy. Results were satisfactory, notwithstanding troublesome vomiting, which lasted for three or four days. While greatly relieved, the man still complains of distress in the stomach.

At this stage of my theme I venture to express the

thought that the ultimate results would have been better if I had performed plastic operations in both these cases to maintain inviolate the duodenal route (Fig. 5).

Because they possess many characters in common and bear closely on this argument, the following cases are included in this study:

CASE 3.—Mary M., aged 76.

History.—This woman gave a long history of gastric pain, sour stomach, vomiting, hematemesis and melena.

Examination.—There was extreme emaciation, great debility, no cachexia. A movable tumor could be felt to the right of the median line. There was extreme gastrectasis.

Operation.—Abdominal section revealed pyloric thickening without adhesions. The pylorus and duodenum were freely movable. The pyloric ring was patent. Most of the thickening was on the distal side of the pylorus. There was stenosis of at least one and a half inches of the duodenum. The thickened portion resembled a segment of cylinder. The anterior surface of the duodenum was soft and pliable (Fig. 6).

For the relief of this case the Heineke-Mikulicz operation was performed. The incision was carried over the anterior surface of the duodenum, beginning beyond the zone of thickening, across the pylorus and into the stomach. The incision was two inches in length and was sutured at right angles to line of incision. The result was faultless. In two or three weeks gastrectasis spontaneously disappeared. The patient survived the operation five years and died of intercurrent disease.

CASE 4.—Case of peculiar severity.

Patient.—Male, aged about 70, suffered thirty years from condition of violent

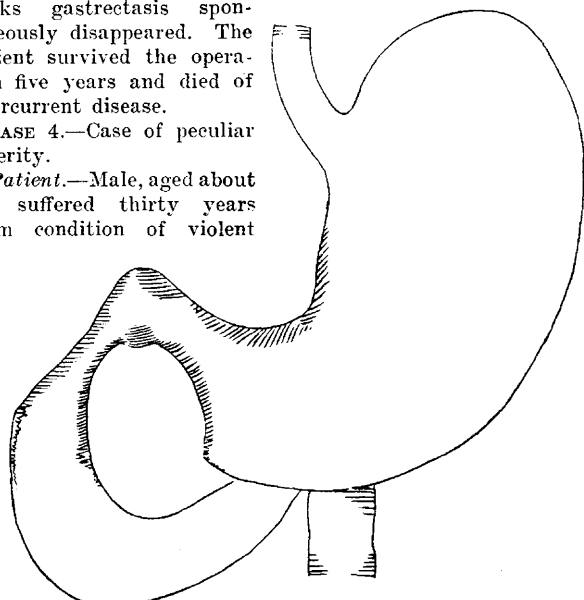


Fig. 7.—Showing extensive stenosis of duodenum, pylorus open, suitable case for duodenectomy and duodenopylorostomy or duodenogastrostomy.

gastric pain. There were repeated moderate hemorrhages, and persistent acid and bilious vomiting. Facies betrayed most intense suffering, there was marked emaciation and a cachectic aspect.

Operation.—Abdominal section. Visceral adhesions were universal. The pylorus and duodenum were fixed. The pyloric part of the stomach was greatly thickened and distorted. The pyloric ring was moderately stenosed. There was a concave depression over the posterior and anterior surface of first part of the duodenum. The duodenal lumen was constricted for one inch or more. The central portion was almost occluded. There was moderate gastrectasis (Fig. 7). A posterior gastroenterostomy was done. Immediate recovery ensued. The patient remained three weeks in hospital and had gained fifteen pounds in weight when he left. After six weeks he suddenly developed persistent bilious regurgitant vomiting and died of exhaustion before he could be brought back to the hospital for relief.

CASE 5.—E. G., aged 38, had had a gastric disorder of six years' duration, with hyperchlorhydria and vomiting. There was no record of hematemesis or melena and no pain except in the lumbar region. There was positive gastric insufficiency with moderate gastrectasis.

Operation.—The pylorus was free and movable; there were no adhesions. There was a wedge-shaped retraction of the upper wall of the duodenum. The pyloric ring was patulous. An incision was made over the anterior wall of the duodenum up to but not including the pyloric ring and extending beyond both ends of the constricted part. It was sutured at right angles to line of incision. Recovery ensued; the result was practically perfect.

The operation performed in this case was duodenoplasty, not pyloroplasty (Fig. 8).

CONCLUSION.

The study of these few cases warrants the following inferences:

1. Duodenal ulcers are marked by great chronicity.
2. They result in deformities of the duodenum and stenosis after many years' duration of the ulcer.
3. The most perfect results of operation are found in those cases in which the duodenal route has been preserved by duodenoplasty.

4. Duodenal ulcers result sometimes in hour-glass contractions of the duodenum and kindred deformities.

The study of this very insignificant remnant of cases suggests the use of the following plastic operations for their relief, the main purpose of the operations being to preserve the duodenal route:

1. Resection of scars and coarctations together with the ulcer-forming regions of stomach or duodenum or both as proposed by Rodman;

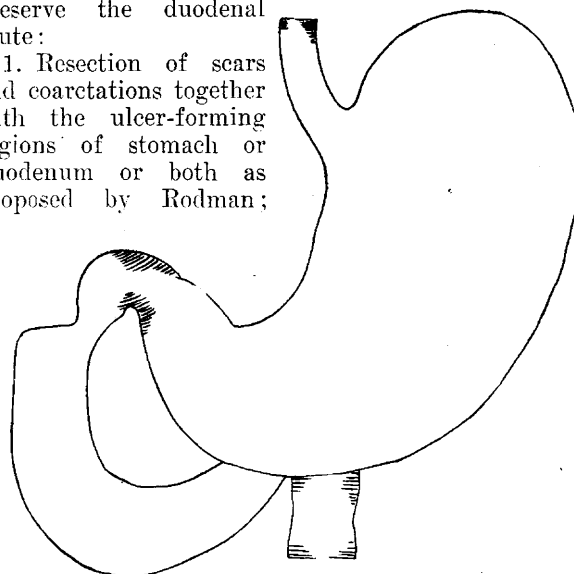


Fig. 8.—Illustrating wedge-shaped retraction of duodenum or saddle-back deformity, susceptible to plastic operation. Pyloric ring open; relieved by duodenoplasty.

apposing by plastic devices the divided parts, always striving to preserve the duodenal route. (The plastic principles of Billroth, Wolfier and Kocher.)

2. Pyloroplasty after Heineke and von Mikulicz.
3. Pyloroplasty after Finney.
4. Duodenoplasty.
5. In suitable cases partial duodenectomy or partial resection of the duodenum followed by duodenorrhaphy by suture or mechanical device.
6. In hour-glass contraction of the duodenum or kindred deformities duodenoduodenostomy by means of a clamp and suture or by plastic device or the McGraw ligature.
7. In pyloric stenosis involving the pyloric ring, partial pylorotomy followed by duodenogastrostomy by clamp and suture or mechanical device.
8. In stenosis limited to the beginning of the duodenum as in Case 6, partial duodenectomy followed by duodenopylorostomy or duodenogastrostomy.

9. In all cases unsuited to plastic measures above outlined, gastroenterostomy.

10. And, because it is held doubtful that the artificial opening will be permanent in the presence of a patent pylorus, any of the above-mentioned operations or combinations of them preliminary to or part of the operation of gastroenterostomy.

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THE TREATMENT OF BONE CAVITIES.

REPORT OF A CASE OF COMPOUND COMMINUTED FRACTURE OF THE HIP, FOLLOWED BY BONY UNION AND A MOVABLE JOINT.*

JAMES E. MOORE, M.D.

MINNEAPOLIS.

I have had so many inquiries concerning an article on the treatment of bone cavities published in *THE JOURNAL*, May 20, 1905, that it seemed that a brief paper on the same topic might interest the members of this Section.

The obliteration of dead space in the soft tissues is a very simple matter since we have learned to use buried catgut sutures, and the treatment of abscesses of the soft parts by incision and drainage is usually followed by speedy convalescence. The obliteration of dead space in bone, however, has been very unsatisfactory. In fact, it has been so difficult that in the majority of cases we have not tried to fill the cavity, but have treated it as an open wound until Nature furnished an epithelial lining for the whole cavity. The method of Neuber, in which the integument is turned into the bottom of the wound and fastened there, is the most certain and speedy of the older methods, but it is only applicable to very superficial bones, like the tibia, and it leaves a most unsightly scar. Schede's method of healing by blood clot is even more unsatisfactory in bone cavities than in the soft tissues, because even when successful the blood clot is absorbed long before Nature can furnish new bone, and the integument is drawn in, leaving a bad scar. In septic and tuberculous bone cavities, and most bone cavities are such, this method is unsatisfactory, because the clot usually becomes infected, no matter what methods of sterilization have been employed. The prevailing method is to pack the cavity with gauze until it is filled with connective tissue and covered by epithelium, and is about the most tiresome and unsurgical procedure surgeons are guilty of. I have one patient who calls on me occasionally now, on whom I performed a sequestrotomy two years ago and treated after this method. He packs his wound himself, and still has a small point deep in the wound without an epithelial covering. Since that time I have learned how to fill bone cavities, and even those operated on but a short time ago are healed, and the healing process has not been accompanied by the tortures of pulling out and putting in gauze. The treating of tuberculous cavities in bone by packing is eminently unsatisfactory, because it is not only tedious and painful, but very commonly unsuccessful, the granulations becoming infected by the tubercle bacillus.

FAULTY TECHNIC.

While our lack of success in the treatment of bone cavities is, in a measure, due to the physical make-up of the tissue, it is largely due to faulty technic, for the

technic of bone surgery has not kept pace with that of surgery of the soft parts. The consequence is that many cases of bone disease have been neglected. It is too common a practice to treat an abscess in the end of a long bone by means of braces and plaster splints until it breaks into the neighboring joint; and this is termed conservatism by those who practice it.

MacNamara's book on "Diseases of the Bones and Joints," published in 1887, is the best book ever written on bone surgery, but it makes no mention of an artificial filling for bone cavities. In 1888, Gerster published his excellent book on "Aseptic and Antiseptic Surgery," in which he advocated the filling of bone cavities by blood clot after Schede, but he made no mention of an artificial filling. Later Senn advocated the use of decalcified bone chips, dusted with iodoform, for the filling of bone cavities. The interspaces between the chips were allowed to fill with blood clot, as in the Schede method. This was the first successful method of artificial filling and was a decided advance, but was too often followed by failure to become popular.

MOORHOF'S BONE WAX.

My experience in the past two years leads me to believe that a new era in bone surgery has dawned and that we can secure so much better results than we have been able to heretofore that bone surgery will become more popular, and that the technic will improve accordingly.

Surgeons have long felt the need of a material with which they could successfully fill bone cavities as dentists fill cavities in teeth, but the filling of a bone cavity which must be covered by soft parts is very different from filling a cavity in a tooth.

With our present knowledge of infection and its results it is easy to understand why all experiments along this line in preantiseptic days were failures.

In 1903, von Mosetig reported a large number of successful results from the use of a new bone plug. Moorhof also reported many successes with it in his clinic at Vienna. In this country it is very commonly known as Moorhof's bone wax. This material consists of twenty parts iodoform, forty parts spermaceti and forty parts of oil of sesame. The ingredients are slowly heated to 100 C. and, when allowed to cool, form a soft solid which remains solid at the temperature of the body. For use it is heated to 50 C., being constantly stirred to keep the iodoform evenly distributed. At this temperature it can be poured into the cavity, where it immediately solidifies. The material does not act as a foreign body, nor does it act as a culture medium. It possesses the inhibitory and medicinal properties of iodoform, without causing iodoform poisoning. Its physical properties are such that it is gradually absorbed and replaced by granulations, and finally by new bone. Moorhof shows many skiagraphs illustrating this process.

The wax, or bone plug, as its inventor terms it, has demonstrated beyond all controversy the feasibility and practicability of an artificial filling for bone cavities.

After the average operation at the present time the surgeon expects to close the wound and to have very little to do in the way of after-treatment, and he is inclined to neglect cases where this agreeable program can not be carried out. With this artificial means of filling dead space in bone, the after-treatment in cases of bone surgery need not be disagreeable or prolonged.

In acute infections of bone there is no place for an artificial filling, because the parts can not be sterilized.

* Read in the Section on Surgery and Anatomy of the American Medical Association, at the Fifty-seventh Annual Session, June, 1906.