

in contact and are sewed together by a number of Lembert sutures in a line. The needle carrying the rubber cord is carried into the stomach and brought out again, the space included being about 5 or 6 cm. in length. It is then entered into the intestine and brought out in a like manner, and the ends are tied "tightly and firmly in a square knot." The ends of the ligature are cut short and are tied together with silk. Lembert sutures are inserted above.

In this operation the ligature cuts through in two or three days, and when it cuts through tissues which are adherent, infection is prevented, and the cord passes away.

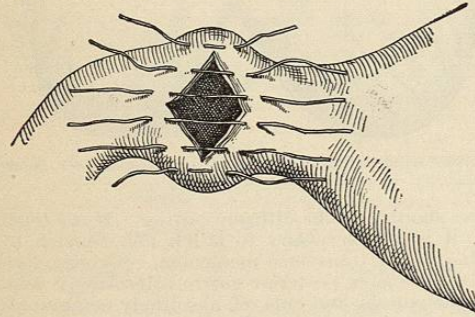


FIG. 4542.—The Heineke-Mikulicz Method of Pyloroplasty. Incision stretched at a right angle to its axis and sutures inserted. (Keen.)

Gastroduodenostomy.—This operation has been strongly advocated by some operators; notably Jaboulay and Mikulicz. The pyloric end of the stomach is anastomosed to the anterior portion of the duodenum. In order to perform the operation successfully, the duodenum must be movable. Of course it is never suited to malignant disease, and cannot be performed when the pylorus is adherent. The great advantage of the operation is that the anastomotic opening is above the bile and pancreatic ducts, and hence regurgitation does not occur.

8. Gastroplasty and Gastro-gastrostomy.—The condition known as hour-glass stomach may be relieved by the performance of Watson's gastro-gastrostomy (*i.e.*, the anastomosis of the portion of the stomach on one side of the constriction with the portion of the stomach on the other side of the constriction); or of Watson's gastro-gastrostomy; or by gastroplasty (the making of a longitudinal incision through the constricted portion, followed by traction upon the sides of this incision, so that it becomes transverse; and the application of sutures so as to maintain it in this transverse or vertical position). The constriction is thus diminished or abolished. Gastroplasty is the preferable method.

9. Pyloroplasty (the Heineke-Mikulicz Operation).—For cicatricial stricture of the pylorus, the older method of Loreta has been practically abandoned, because after

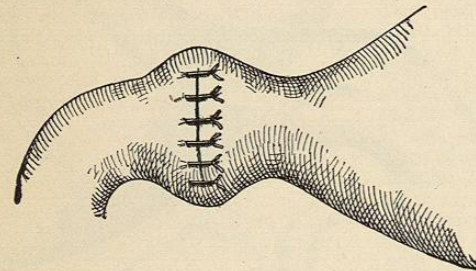


FIG. 4543.—The Heineke-Mikulicz Method of Pyloroplasty. Sutures tied and lumen of pylorus inserted. (Keen.)

its performance recurrence is almost inevitable. In such a case, if gastro-enterostomy is not advisable, we perform pyloroplasty—*i.e.*, the surgeon makes a longitudinal incision through the constriction, holds the edges apart to make the line of incision appear vertical, and so applies his stitches as to maintain the vertical direction of the

suture line. Thus the constriction is either mitigated or abolished. Mayo points out that pyloroplasty may fail because the degenerated gastric muscle cannot lift the food from the gastric pouches to the high pylorus. If it does fail, do gastro-enterostomy.

10. Pylorotomy.—This is the operation of excising the pylorus with a portion of the pyloric end of the stomach. Its performance is practically restricted to malignant disease. The operation was first performed by Péan in 1879.

The mortality of the operation is extremely great, but has been considerably reduced in recent years. One reason of the high mortality is that many cases have been operated upon too late, when advanced cachexia or wide diffusion of the growth was present. The later we operate and the more marked the adhesions, the heavier the mortality. Wölfler says that the mortality in cases with extensive adhesions is over seventy-two per cent., and that in cases without extensive adhesions it is under twenty-eight per cent. Mayo's mortality is only fourteen per cent.

It is rarely that genuine cures are effected by the operation in proved cases of cancer, and it is only when the procedure is undertaken early that there is any real chance of cure. Nevertheless there are more than forty cases in literature which survived three years or more. To give a real chance of cure, the operator must cut wide of the growth on the stomach side. As a matter of fact, the growth usually returns.

As a rule, the abdomen is not opened until a tumor can be palpated, and then it is generally too late for pylorotomy. This fact emphasizes the enormous importance of an exploratory incision in doubtful stomach cases. As making such exploratory incisions becomes more and more the practice, pylorotomy will become more and more successful; because it will be performed earlier. Pylorotomy is a proper operation if the pylorus is not firmly anchored by adhesions, if there is no dissemination into adjacent organs and structures, if

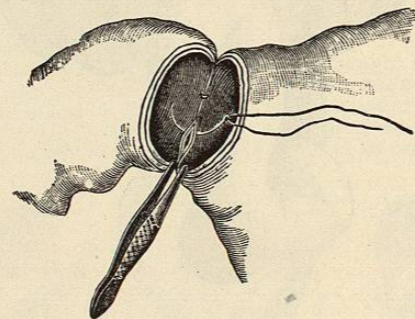


FIG. 4545.—Suture of Mucous Membrane from within after Pylorotomy. (Tillmanns.)

there are no distant metastases, and if the affected lymph glands are removable; otherwise, gastro-enterostomy should be done.

The older method of Billroth gave a mortality of from thirty-eight to forty per cent., as a rule. In this method, after the resection of the tumor has been accomplished, it is found that the wound in the stomach is larger than that in the duodenum; the stomach wound must therefore be lessened by suturing, until it is practically of the same size as the duodenal wound, when an end-to-end anastomosis is performed.

Kocher's method has been much more successful, and is said by Mayo to give a mortality of only sixteen per cent. In this method, after the tumor has been removed, the stomach end of the cut is completely closed, and the

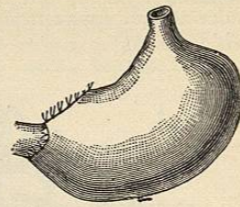


FIG. 4544.—Billroth's Method of Pylorotomy.

duodenum is implanted in the posterior portion of the stomach wall. Mayo follows Kocher's method with a slight modification. He tells us that Kocher has performed pylorotomy fifty-seven times, that eleven of the patients were living a considerable time after operation, and that five of them were living a sufficient length of time afterward to be regarded as cured.

11. Gastrectomy.—*a. Partial Gastrectomy.*—By partial gastrectomy we mean excision of a portion of the stomach. The operation of pylorotomy really includes a partial gastrectomy. We may remove a small portion of the stomach, a considerable portion, or almost the entire organ. In any of these cases the operation is a partial gastrectomy. The operation may be performed for malignant disease or for ulcer. After the extirpation of a malignant growth or of an ulcer, sutures are inserted in the manner recommended by Halsted.

b. Total Gastrectomy.—This operation was first performed by Connor, of Cincinnati. The first successful

operation was performed by Schlatter, of Zurich. The operation has now been performed a number of times. Whenever possible, the duodenum is attached to the esophagus, and it is a matter of surprise how easily this has often been effected. If it is found to be difficult or impossible to do this, an opening is made in the jejunum, and this portion of the bowel is attached to the esophagus. This operation should, of course, be attempted only in cases in which practically the whole of the stomach is involved, in which the organ is still movable, in which there is no involvement of adjacent structures or viscera, in which there is no metastasis, in which the lymphatic glands are removable, and in which it is possible to attach the esophagus either to the duodenum or to the jejunum.

It is remarkable how well digestion is performed in cases in which the whole stomach has been removed; but, of course, during the progress of chronic disease, portions of the intestinal canal gradually take upon themselves the functions of the stomach and really effect digestion for quite a while before the removal of the stomach. It is in very rare cases that this operation is necessary, but it is undoubtedly that it is occasionally justifiable.

12. Jejunostomy.—This procedure is occasionally recommended for malignant disease, when gastro-enterostomy is rendered impossible because of the situation of the growth. The permanent opening in the jejunum is used for the purpose of administering food. Either the jejunum itself, cut across, may be brought into the wound, or a tube may be inserted into the wall of the jejunum, exactly as is done in gastrostomy. The operation is very rarely necessary, but in some cases is to be employed.

Exploratory Laparotomy.—In view of the imperative necessity for early diagnosis, if we would successfully cope with many gastric diseases, and especially if we would hope to cure malignant disease, exploratory laparotomy is frequently indicated. The exploration is made to clear up doubt; and after the condition is ascertained, the incision may be enlarged and a radical or a palliative operation may be performed. The surgeon who never operates until the diagnosis is certain must often delay

so long in reaching a conclusion that when he is sure what the matter is, he is equally sure that any operation is entirely useless. Dr. J. B. Murphy strongly endorses the following statement made by MacDonald (Chicago *Medical Recorder*, June 15th, 1902): "In a chronic, progressive gastric trouble that is unamended by careful diet and drug treatment; that is accompanied by loss of gastric motility and diminution in gastric peristalsis; and that is attended with emaciation, in spite of forced feeding—especially if associated with progressive reduction in the hæmoglobin, diminution in the hydrochloric acid of the gastric juice, and moderate leucocytosis—an exploratory operation should certainly be performed." With the foregoing statement I am in hearty accord; and when an exploratory operation is performed in such cases, a cancer will usually be found.

Operation for a suspected malignant growth may disclose an innocent growth, and a condition that would have been destructive to life without operation may be

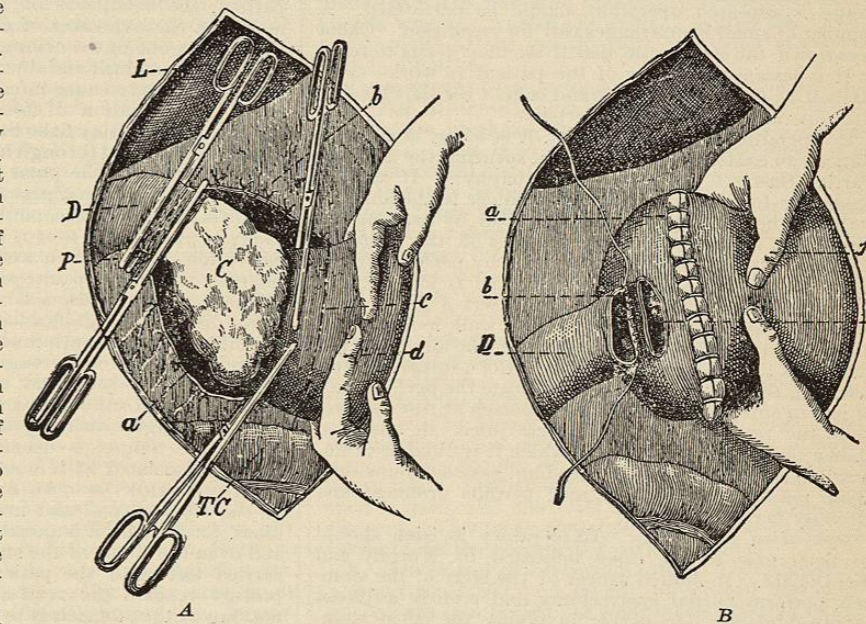


FIG. 4546.—Kocher's Method of Pylorotomy (A) and Posterior Gastro-enterostomy (B). (Kocher.)

permanently cured. I have recently performed an exploratory operation in a case in which the symptoms indicated cancer, and yet in which it was ascertained during the operation that the whole condition was due to cicatricial obstruction of the pylorus. A complete cure followed the performance of pyloroplasty. In conducting an exploration for disease of the stomach, it is necessary, in some instances, not only to open the abdomen, but also to perform exploratory gastrostomy.

Operations for Ulcer.—It is imperative to remember that the symptoms of perforation are not always certain; hence, when the symptoms that are supposed to indicate perforation are present, an exploratory operation must be immediately performed. When we believe that an ulcer has perforated, the proper means for bringing about reaction should be adopted and the abdomen should be opened. There will usually be an escape of odorless gas and fluid, and food will often be found in the peritoneal cavity. The site of the ulcer may sometimes be located by the presence of adhesions, but at other times no adhesions are present, and a very careful search is then necessary.

When the ulcer has been found, it is enough, in most instances, simply to close the perforation with inversion sutures, as described under the head of gastrorrhaphy.

Some surgeons advocate excision of the ulcer as well. When the ulcer's margins are not markedly indurated, and when inversion can be readily effected, it is not worth while to excise. In perforation excision is rarely necessary. In some ulcers which have not perforated and in a few which have, excision is advisable. In a recent case in the Philadelphia Hospital, I was obliged to excise an ulcer which had not perforated. Excision was required because the surrounding induration made marginal inversion impossible. The abdominal cavity is then carefully cleansed, the stomach is washed out, a piece of gauze for drainage is carried down to the stitch line, and the abdominal wound is closed.

In ordinary, non-perforating ulcers, medical and dietetic treatment is indicated in the majority of cases; but if, in spite of such treatment, a patient grows progressively worse, if the pain is violent, or if tenderness is marked, the abdomen should be opened and the stomach should be inspected. A single acute hemorrhage, even if large, does not call for operation; but if the hemorrhage is repeated, operation should be performed. A number of small hemorrhages call for operation. Cabot lays down the sound rule that if an ulcer tends to recur or if it lessens the ability of the patient to work—especially if he must work to live and cannot regulate his diet—an operation should be undertaken.

In operating for chronic ulcer, it is wiser, in most instances, to excise the diseased area, suturing the gap (see Partial Gastrectomy and Gastrorrhaphy). If we are operating for hemorrhage from an ulcer in the anterior wall, the hemorrhage is best controlled by excising the ulcer. In hemorrhage from an ulcer in the posterior wall, the site of trouble is determined by performing exploratory gastrotomy. When the ulcer is located, tear through the gastrocolic omentum, insert a finger back of the stomach, invert the posterior wall, look for the ulcer through a gastrotomy wound in the anterior wall, and arrest the bleeding with a ligature or a suture. After arresting the hemorrhage some advocate the performance of gastro-enterostomy to put the stomach at rest and prevent the retention of acid gastric juice. It has been shown that in cases of ulcer in which it is difficult or impossible to reach the seat of bleeding, gastro-enterostomy alone puts the stomach at rest, permits drainage, and strongly favors cure.

Operations for Cancer.—Exploratory incision should be performed in the cases indicated by Murphy and MacDonald. In limited cancer of the body of the stomach, perform partial gastrectomy and remove adjacent involved glands. In cancer involving the entire stomach, the viscus being movable, adjacent organs being free from disease, no demonstrable metastases existing, and the involved glands being obviously removable, complete gastrectomy is a justifiable operation. Pylorotomy is performed in cancer of the pylorus; but only in cases in which there are no extensive adhesions, no metastases, and no involvement of adjacent viscera, and in which the involved lymph glands are removable. In cancer of the cardiac end of the stomach in which the œsophagus is involved, removal by excision is scarcely justifiable and gastrotomy is practically useless. In some cases jejunostomy should be considered. If a radical operation is impossible in cancer of the body of the stomach, no palliative operation is indicated, except possibly jejunostomy. If a radical operation is impossible in cancer of the pylorus, gastro-enterostomy is performed, or, in rare cases, jejunostomy. *John Chalmers Da Costa.*

STOMACH, DISEASES OF.—Within recent years the literature in gastric diseases has grown so extensively that numerous text-books, good, bad, and indifferent, are now issued. Among the best for the practitioner may be mentioned: Riegel, "Die Erkrankung des Magens," Wien, 1896 (an American edition has just been issued, 1903); Boas, "Diagnostik und Therapie der Magenkrankheiten," Leipzig, 1897; Einhorn, "Diseases of the Stomach," New York, 1900; Hemmeter, J. C., "Diseases of the Stomach," Philadelphia, 1903; Van Valzah and Nis-

bet, "The Diseases of the Stomach," Philadelphia, 1898; Lindner and Kuttner, "Die Chirurgie des Magens," Berlin, 1898; Martin, S., "Functional and Organic Diseases of the Stomach," London, 1895; Gillespie, "A Manual of Modern Gastric Methods," Edinburgh, 1899; Osler and McCrae, "On Carcinoma of the Stomach," Phila., 1900; L. Brunton et al., in Allbutt's System of Medicine, London, 1897.

In preparing the various sections the writers have drawn freely from some of these authors, where special arrangements and topics have appealed to their requirements.*

I. METHODS OF EXAMINATION IN GASTRIC DISEASE.

Inspection.—This includes both a general examination of the patient and a special investigation of the abdomen in general, and the stomach in particular.

The *general examination* concerns the *nutrition* of the patient, the conditions of the *skin* as to dryness and moisture, the evidences of cachexia, etc. The state of the *teeth*, as one of the common causes of gastric disorder, should be examined and due note made of any condition there which may cause infection—*e.g.*, unnecessary bacterial contamination of food, faulty mastication, etc. Often a false set may fit so badly as to be the sole cause of dyspepsia, induced through insufficient mastication alone. The condition of the *gums* is likewise important. So, too, the state of the *pharynx*, more especially in chronic gastritis, in which the morning vomiting is often due solely to pharyngeal mucus swallowed during the night. Salivation, too, is often associated with disease of the pharynx and of the palate and tonsils.

The state of the *tongue* is very much over-estimated as to its diagnostic significance in gastric disorders. It is the mirror of the mouth much more than of the stomach. There may be a clean tongue in cancer of the stomach, while with merely carious teeth there may be persistent coating. As a rule, however, there is apt to be a clean, reddened tongue with hyperchlorhydria, while with sub-acidity the tongue is usually coated. A dry tongue is usually associated with mouth-breathing.

EXAMINATION OF THE ABDOMEN.—*Special inspection* of the stomach and abdomen is useful in not a few diseases, for in them it is possible to tell the size, situation, and even the shape of the stomach. This method is best carried out with the patient lying down, as the erect posture renders the recti abdominis rigid. Normally, nothing of the stomach is to be seen.

Among the abnormal conditions which can often be detected by inspection alone are abnormal distention with gas, gastrectasis (idiopathic or obstructive), stenosis of the pylorus (when the tumor is visible and peristaltic waves are evident), hour-glass constriction, peristaltic unrest (a neurosis), and gastroptosis.

Inspection is aided by *inflation* or *insufflation*. This is carried out by one of two methods:

1. Administration of sodium bicarbonate and tartaric acid in separate solutions, the gas forming in the stomach when the two solutions come into contact.

The details of this method are as follows: According to the age and size of the patient, from half a drachm to one drachm of each is placed in separate tumblers which are then filled to one-third with water. The tartaric acid is first administered, and, before the second tumbler is offered, the patient is directed to retain whatever gas may have formed; then the sodium bicarbonate is administered and the patient is told to lie down. With the body in the horizontal position the inflated stomach rises out of the general level of the abdomen, and a satisfactory inspection of the organ can then be made.

Remarks.—An unsatisfactory result may be due to insufficient dosage, the stomach being more capacious than

* Sections I., II., III., IV., V., VII., VIII., IX., and X. are from the pen of Dr. Charles F. Martin, while the remaining ones (on "Neuroses," "Simple Tumors," "Displacement of the Stomach," and "Foreign Bodies") have been written by Dr. F. Morley Fry.—*Editor.*

Auscultation and auscultatory percussion have not as yet proved of any great practical value in diagnosis.

Illumination of the stomach by the gastrodianthene is sometimes valuable in locating its site, but has little other practical use. As a means of demonstrating the abnormal positions of the organ, it is an excellent method if the patient has a thin panniculus.

EXAMINATION OF THE DIGESTIVE AND MOTOR FUNCTIONS OF THE STOMACH.—For this purpose the best means known is by the examination of the gastric contents after administering a test meal of given quantity and quality. This is more satisfactory and reliable than the older method of examining the gastric juice alone after physical, chemical, or electrical stimulation. It is by no means essential in all cases of gastric disorder to employ test meals or the tube; indeed, the tube is used far more frequently than is necessary or even wise. The cases should be selected according to their needs. After a given test meal has been removed we are enabled to decide from the examination to what extent the motor functions are active, and after analyzing the chemical nature of the contents we can tell to what degree the various constituents of the gastric juice are being secreted as aids to digestion.

Three types of test meals are to be recommended:

1. *Test Breakfast:* One piece of dry bread or toast (60 gm.) and a breakfast cup of weak tea (without sugar or milk). This is to be taken slowly, the bread being well masticated and the tea drunk gradually. One hour later this may be removed and examined.

Such a breakfast should have a residue of not more than 75 c.c.; should be of gruel-like consistence; should contain about fifty per cent. total acidity, free hydrochloric acid ten per cent., combined acid forty-five per cent. Such a meal contains albuminoids, sugars, salts, starches, and extractives, and makes no great demand upon the stomach—a point of importance where there is difficulty of digestion. The disadvantage of such a meal is in the fact that it scarcely demands sufficient effort on the part of the secreting glands of this organ.

2. *The Test Lunch of Germain Sée:* A large piece of bread (120 gm.), a cup of water, and 60 gm. of minced meat. This should be removed for examination two hours later. Little more than 200 c.c. will remain from such a meal, and the total acidity will be about sixty per cent. This meal, containing a more varied diet, still further tests the powers of gastric digestion.

3. *Test Dinner of Leube and Riegel:* This consists of a plate of soup (350 c.c.), 60 gm. of scraped beef, and 60 gm. of wheaten bread. In some meals potatoes in purée form and a tumbler of water are added. This meal should be removed four or five hours later, and will contain a still larger amount of hydrochloric acid (total acidity from sixty-five to seventy per cent.), and it will also give the secretory glands a fair test of their functional powers. Another advantage of this meal is that the macroscopical appearances of the contents give at a glance a fair estimate of the way digestion is proceeding, especially as regards the motor power and the digestive power for proteids. Its disadvantages are the risk of clogging of the tube, the long delay after the meal, and the fact that it is often not readily digested.

Method of Removing a Test Meal.—For this purpose an ordinary stomach tube, thirty-six inches (about 90 cm.) long and of different diameters, should be at hand. One should be careful merely to select one of sufficiently large calibre to allow the pharyngeal muscles to grasp it properly, and not so pliable as to bend in the mouth too easily when introduced. The end should be rounded and provided with two velvet-eye orifices, and it really matters but little whether these be both lateral or one terminal and the other lateral. With ordinary care there is but little danger of injuring the mucosa of the stomach with the tube end. A bulb attached to the upper end of the tube may be of use in removing the contents by suction; but it is not an essential, as the tube itself may be so pressed and pulled as to create suction and thus withdraw the contents. When it is desired to wash

anticipated, or to adhesions, or to its situation chiefly in the left hypochondrium or under the ribs, or to incontinence of the pylorus, or, finally, to excessive gastric peristalsis. Or, again, too much gas may be formed and intense pain and unavoidable emesis follow. The physician should have a stomach tube, a basin, and a towel at hand in case the retention of gas give rise to great pain or to sudden uncontrollable emesis.

2. The second method is the introduction of air by means of the stomach tube, the air being propelled by the double-bulbed Higginson's syringe. This has the advantage of controlling the amount of air introduced and the disadvantage incident to passing the stomach tube. This method should never be tried till the patient has used the tube at least once previously, and air should never be introduced in such amount as to cause severe gastric pain. The contraindications to either of these methods are ulcer, recent hematemesis, atrophy of the mucous membrane, peritonitis, and advanced cardiac and arterial disease.

Palpation.—Palpation should be performed gently, systematically, with warm hands, the fingers being held flat on the abdomen at first, and the patient recumbent, breathing gently and with knees flexed. Palpation is easier when the stomach is empty, though tumors and the stomach outlines are often felt best after inflation. Narcotization is sometimes necessary to allow of satisfactory palpation, and is indeed to be strongly recommended in doubtful cases. Any tenderness found should be localized definitely and its degree ascertained. Boas' algometer has not been found of any great value in diagnosis.

Tumors of the stomach do not move with respiration, as a rule, the stomach being rather broadened out by descent of the diaphragm. Only when they, or the stomach, are adherent to the solid parts which move with respiration can they be made to descend on inspiration, and with expiration they may often be fixed by intervention of the fingers above the tumor.

Succussion.—Succussion implies detection of fluid with air, in a body cavity, by shaking the patient or the portion examined. The patient lies upon his back and relaxes the abdominal muscles. The physician, then grasping the iliac bones and lumbar muscles on both sides, quickly shakes the patient and a splashing sound is heard. Occurring under certain conditions this is distinctive, but may be simulated by fluid in the colon as well. Presence of this sign in the stomach is only pathological when found to extend over an abnormally large area or at times when the stomach is normally empty (*e.g.*, in gastrectasis, five or six hours after a meal), and should not be otherwise regarded as evidence of disease.

It is doubtful if much reliance for the diagnosis of atony can be placed on the following method: Give the patient half a glass of water and try succussion. If this be obtained it arouses suspicion of atony. Therefore try again in half an hour, and, if a positive result is still obtained, then atony is present. If no succussion be present the motor power of the stomach is normal.

In testing for succussion the triangular area of the stomach in contact with the abdominal wall—*i.e.*, the triangle formed by the midline of the abdomen, the left costal border, and a line joining the cartilages of the ninth ribs—should be especially examined.

Percussion.—This evidence varies according to the amount of contents—food or air. The organ is to a large extent inaccessible normally to percussion—only the above-mentioned triangular area and Traube's semilunar space being easily outlined. Percussion may reveal the size, situation, and shape of the organ and the presence of tumors. Increased area may be due to megalo-gastria, retracted lung or liver, ptosis, weighty tumors, and dilatation. Diminution in the size of the area may result from left pleural or pericardial effusion, pneumothorax, hypertrophied heart, enlarged spleen or left lobe of liver, etc.

Percussion is much assisted by inflation, less so by administration of fluid.