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THE GYROMELE IN THE DIAGNOSIS OF STOMACH AND INTESTINAL DISEASES.*

FENTON B. TURCK, M.D.

CHICAGO.

The gyromele (revolving sound) is a flexible steel cable, terminating in a more flexible steel spiral end. This spiral end is provided with a metallic pellet, and covered by a sponge, lamb's wool or cotton. The sound is fastened in a revolving apparatus—not unlike a surgeon's drill. After introduction into an accessible cavity of the body, if the revolving apparatus is put in motion, the rotations of the cable cause vibrations of varying degree which, being transmitted through the tissues, are perceived externally by means of auscultation and palpation.¹

Cables of different caliber and length have been devised in order to obtain cables of different degrees of flexibility and elasticity, which considerably broadens the scope of usefulness of the gyromele, especially for diagnostic purposes.⁴ But it is not only the extraordinary adaptability, flexibility and elasticity which enable the instrument to enter cavities hitherto inaccessible, but the rotary motion adds greatly to the safety and facility of the use of the gyromele sound.

Since the delicate rotations gently wend their way through any possible narrowing, and these rotations can be followed externally by the auscultating ear or the palpating finger; we are enabled to gain valuable information of cavities which were formerly inaccessible. This information is limited not alone to anatomical data, as situation, extension, capacity, etc., of the sounded cavities, but by means of specially constructed gyromele sounds we may obtain valuable data as to the contents of these cavities, adherent masses of mucus, bacteria, etc. Thus, I have been able to remove, by these means, bacteria from different regions of the stomach, and make extensive studies of the normal and pathologic flora of this organ.^{3 4 5 6 11 14 18} The following cavities have been explored successfully with the gyromele: Nose and throat; esophagus; stomach; pylorus and small intestine; colon; bladder; uterus; thoracic cavity; false cavities of various character.

Various attempts had been made before the year 1894 to sound the stomach. Exploration with the stomach-tube for sounding the stomach was not successful, as no means of locating the tube within the stomach, such as by palpation, were presented, and, therefore, Leube attempted to locate the great curvature of the stomach by pushing in a stiff sound. Ewald ("Diseases of the

Stomach," Am. Trans., 1892) shows the impossibility of locating the curvature of the stomach by using the stiff sound, in the following language: "A stiff sound is introduced into the stomach until it meets with resistance, as far as is feasible, without the employment of undue force. If, now, the sound can be palpated below the level of the umbilicus, dilatation of the stomach is proved to exist. This method has been objected to on the ground that it is dangerous, and that it is frequently impossible to feel the tip of the sound. Leube has rejected both objections, and, so far as the former (danger) is concerned, I fully agree with him. Feeling the point of the sound through the abdominal wall is an entirely different matter. It is most frequently utterly impossible to feel the sound distinctly, even if we go over the whole abdomen as carefully as we can, palpating one square inch after another. Further, we must remember that the stomach is not infrequently in a vertical position, etc. For all these reasons, palpation with the sound will only give uncertain results."

As sounding the stomach with a stiff sound was proved to be both impossible and impractical for diagnostic purposes, the method was abandoned. No other attempts appear in literature of the use of the gastric sound for diagnostic purposes, until the publication of my method (1894) of using a revolving flexible sound, which is not only an advance of all other methods, but is based upon a different principle.¹

1. The flexibility of the sound is of such a degree as to adapt itself accurately to the situs, shape and size of the organ.

2. By means of the revolving apparatus (drill) to which the sound is attached, vibrations are produced which can be palpated and auscultated externally, thus giving us exact information of the presence and locations of the revolving cable.

3. The situation of the metal sound can also be verified *intra vitam* by means of the x-rays. The fluoroscope and the skiagraph give excellent results.

4. Percussion of the inflated stomach is rendered more facile and exact when the border-line of the stomach has been established beyond doubt, by means of the introduced cable. Only then are we enabled to distinguish the finer differences of sound between the stomach and the intestine.

ESOPHAGUS.

The difficulty and impossibility of ascertaining the exact position of the cardia, *intra vitam*, has led to methods of determining the length of the esophagus in the living, by means of external, anatomical landmarks. The usual method is to measure from the line of the incisors externally to the xyphoid appendix of the sternum, giving the sound a corresponding curve. Others measure from the incisors along the lobe of the ear to the tenth dorsal vertebra. The following is

* Presented by invitation at the Exposition of Diagnostic Instruments, in connection with the Congress of Internal Medicine, Berlin, April, 1901.

Rosenheim's method: From the second spinal process along the median line, to the costal articulation of the twelfth thoracic vertebra on the left side. This represents the length of the gullet from the uvula to the cardia; the distance between the uvula and the incisors must be added to the obtained figure (7 cm.).

It seems unnecessary to call special attention to the inaccuracy of these methods. The gyromele is the only instrument which, by the above-mentioned vibrations, makes its presence manifest as soon as it enters the stomach. If the presence of the end of the rotating sound—which is provided with a conical tampon of cotton or sponge—is once ascertained, it is then easy to exactly localize the cardia by gently withdrawing the sound until it meets with slight resistance—the narrowing of the cardiac portion of the esophagus.

The accidents reported in connection with sounding of the esophagus are appalling. These mishaps will

being the distance from the incisors to the cardiac end of the esophagus.

The cable I have used for special esophageal diagnosis is of medium flexibility (No. 2, about 60 cm. in length). The cable terminates with a more flexible spiral end, which is provided with a metallic pellet, thus affording a means for the attachment of a cone-shaped cotton pledget or sponge. (Fig. 5.) When it is desirable and of advantage, the cushion of cotton or sponge is covered with a thin rubber finger-cot, tied and secured with a fine silk thread. This greatly facilitates the introduction of the cable and renders the same less dangerous than the use of any of the described instruments.

Where greater accuracy is desired, the location of the narrowing at the cricoid cartilage can be ascertained in the same manner with the additional assistance of rotary vibration, which can be easily felt at this point externally.

Where there is a patulous condition of the cardiac orifice, this orifice may not offer sufficient resistance, so the cotton pledget attached to the end of the cable is increased in thickness and the procedure repeated. The attachment of the cotton or wool pledget is an easy procedure: While the cable is being rotated, a small layer of cotton is allowed to wind itself firmly around the pellet of the spiral end of the cable. This forms the apex of the cone. A second larger layer is then placed a little above and overlapping the first layer, forming the base of the cone. More and larger layers of cotton can be added, according to the size of the pledget required.

Attachable cone-shaped sponges may be used instead of cotton pledgets. By covering the cable with a tightly-fitting rubber tube, as described,¹⁶ which is graduated in centimeter scale, the measurements from cardia to incisors can be readily read from the cable.

Intragastric Bag, (JOURNAL A. M. A., June 11, 1896).—I have also used rubber bags attached to a double tube, through one of which the gyromele cable is introduced; the other serves for the introduction of air for inflation of the rubber bag. To prevent escape of air through the first or cable tube, the opening of this tube is occluded by a rubber stopper through which the cable passes. The passage of the bag through the cardiac opening into the stomach is detected in the usual manner by external palpation of the rotating end of the sound. After inflation and partial withdrawal of the bag, it meets with the cardiac resistance. (Fig. 6.) This, however, is not as reliable as my other methods, for the reason that the inflated bag occupies the gastric funnel-shaped portion of the cardia, thus meeting the resistance of the gastric walls,¹⁵ and not of the cardiac orifice proper; this results in false measurements of the length of the esophagus and false location of the cardia. This is the reason why McCaskey in measuring the esophagus by means of this method obtained greater figures of the length of the esophagus than did other observers (Proc. of the Am. Gastroenterological Society, 1900).

I have frequently, in the past, called attention to the fact that by this method of using the gyromele strictures could be located in the esophagus, not only by measurement of the distance from the point of obstruction to the incisors, but by palpating and auscultating the vibrations of the gyromele at the seat of the obstruction.^{4 7 9} Thus, Ferguson²¹ was able to locate exactly an obstructing tumor opposite the bifurcation

be reduced to a minimal number if an instrument is used which combines elasticity, flexibility, with a cushioned extremity, and, when introduced, does not depend on the pushing force, but rather upon the gentle rotary motions, thus wending its way by any partial obstruction which it may encounter, without danger of injury.^{1 3 4 7 9}

The gyromele is introduced like the ordinary stomach-tube. The vibrations of the rotating end are palpated as soon as this emerges from behind the ensiform appendix of the sternum; then, as has been described, the sound is withdrawn until the cone-shaped cotton tampon or sponge attached to its end is marked at the point of the incisors by means of a tightly-fitting, movable, rubber ring. The gyromele sound is then completely withdrawn and the distance measured from the rubber ring to the base of the cone-shaped cotton tampon, this

of the trachea, before operation. He states: "Upon using Turk's gyromele, we could feel the rotation of the sponge, which was most marked opposite the bifurcation of the trachea." By the same means, diverticula of the esophagus may be explored, and, further, it may be ascertained whether the sound has entered a diverticulum or has passed into the stomach, which is determined by palpation and auscultation of the rotating sound.

STOMACH AND INTESTINES.

For the past eight years I have made extensive use of the gyromele in the exploration of the stomach and intestines, for various diagnostic purposes. In 1893 I first examined and treated a series of interesting cases, proving the accuracy of my methods when combined with the extant methods.⁴

CASE 1.—Dec. 5, 1893, J. J., aged 44. Not alone were we enabled to localize the greater curvature 5 cm. below the umbilicus, but it was also possible, by the aid of the gyromele, to diagnose a thickening of the pylorus with absolute certainty.

CASE 2.—Nov. 3, 1893, Mrs. J. L., aged 51. Localization of the greater curvature below the umbilicus, discovery of a tumor in the anterior wall of the stomach, and bacteriologic examination was made.

CASE 3.—A. M. C. Greater curvature below the line of umbilicus and also tumor-like thickening of the anterior

Fig. 4.—Rubber coated metal cable with metal pellet end.

gastric wall. Report of necropsy (published) confirmed the diagnosis, and proved that with the aid of the gyromele it is not only possible to exactly determine the dimensions of the stomach, but also to diagnose, *intra vitam*, thickenings and tumors of its walls.

CASE 4.—Nov. 4, 1894, L. S. By means of the gyromele, the greater curvature was found 4 cm. above the umbilicus-line. An explorative laparotomy confirmed this, and revealed a scirrhus along the lesser curvature.

I have had numerous occasions in the past eight years to make the diagnosis by the aid of the gyromele and see it confirmed by laparotomies and necropsies.⁴ I have also reported that during abdominal operations performed by Murphy, Newman, Ferguson, Beck, myself and others, I could determine with exactness the vibrations of the revolving sound.³⁰

Dr. Borland and myself have reported on a series of experiments with the gyromele on the cadaver. It must be admitted that the phenomena due to the gyromele are more positively manifest in the living.³⁰

During transillumination of the patient with the x-rays, a procedure which I have used since 1896, it could be clearly observed how the sound made its way through the stomach and pylorus into the small intestine.³⁰

CASE 5, which I demonstrated in London, in 1898, (Demonstrations and Lectures at St. George's Hospital,

August 8, 9 and 10) was that of a woman 50 years of age, who had shown stomach symptoms for over a year. The vibrations of the gyromele could be felt through a paper placed upon the abdomen of the patient, and thus an exact drawing of the contour of her stomach could be made. An accurate description of this case is to illustrate the technique of gastric diagnosis by means of the gyromele. The patient manifested all the symptoms of retention of food—frequent vomiting, emaciation, etc.⁴¹

Aug. 8, 1898, three hours after a test-meal, a very flexible gyromele sound was introduced, the patient

Fig. 5.—A, with first layer of cotton or wool; B, the finished conical cotton tampon (to be covered with rubber); C, the spiral end with metal pellet.

being recumbent. Location of the greater curvature was determined through the vibrations of the rotating gyromele, and found to be on the line of the umbilicus, "and by pushing the cable further into the stomach until the revolving sponge impinges against the lesser curvature, we find it located just below the border of the left lobe of the liver. On withdrawing the gyromele and testing the liquid which can be obtained by squeezing the sponge, we find that there is no HCl present in the stomach. The outline and position of the stomach, as thus determined, are shown by the diagram. (Fig. 7a.) . . . In order to determine the degree of

distensibility of the stomach, we now pass in a gyromele having a somewhat *less flexible* cable than the one just used, and again determine the outline of the stomach by palpating the revolving and vibrating sound. This time, with the patient sitting upright, we find the greater curvature below the umbilical line and quite near the hypogastric line, while the lesser curvature can be distinctly outlined just above the epigastric line. As shown in the diagram (Fig. 7b), we find with this second cable that the stomach is only slightly dilated, but that it is a case of marked gastropptosis with very lax ligaments, the stomach being freely movable in its position. The long duodenal cable is next introduced for the purpose of sounding the pylorus. The sound is obstructed as it reaches the pylorus and further pushing only elicits signs of pain. The tip of the revolving sound can easily be recognized and the palpation indicates a hardened and thickened pylorus, but no tumor can be felt."

From the examinations thus made, we arrive at the following diagnosis:

1. Absence of free HCl after various test-meals, together with the failure of the gyromele to produce a

Figure 6.

secretion of the acid, would indicate atrophy of the glands.

2. The slight dilatation of the stomach, together with the ease with which the whole viscus can be pushed downward, as shown by the use of cables of different flexibility, indicates the presence of gastropptosis and the thickened walls show hypertrophy.

3. The long retention of food indicates either motor insufficiency due to myasthenia, or pyloric obstruction, and as the duodenal sound indicates a hardened and thickened pylorus, we conclude that this is a case of stenosis pylorica. In view of the fact that the pyloric obstruction, notwithstanding the marked atrophy, is almost complete, I recommend immediate operation.

"(Through the courtesy of Dr. Ewart, the attending physician in charge of the case, the following hospital report has been received:.) Operation was performed by Mr. Jaffrey on August 17. No outlying mass of cancer or glands could be felt. The stomach was of *moderate size* with thick muscular walls and *did not reach below the umbilical level*. Owing to its *dropped state* it could be easily pulled through the incision as well as the pylorus. The pylorus and its vicinity were free from

peritoneal adhesions or thickenings. There were a few superficial pyloric venules and minute whitish specks, but no important engorgement. The gall bladder was greatly distended with bile. *Marked thickenings could be felt not only at the pylorus, but in one inch or two inches along the duodenum and two inches or three inches along the lesser curvature.* This decided Mr. Jaffrey to prefer gastro-jejunostomy to pyloroplasty, and this was accordingly performed with satisfactory results, the patient doing well for two days. On the third day she began to vomit. Exhaustion set in on the fourth day, when she died. At the necropsy, no tympanites or peritonitis could be found. The external and the stomach wounds were sound. *The thickening which had been felt, was found to be almost entirely muscular, traversed from within by a few fibers from a thin radiating deposit with white fibrous tissue in the sub-mucous layer.* In connection with this, the mucous membrane at the pylorus and for one inch beyond, was atrophied, glistening and striated.

"There appeared to be nothing in the case, judging

Fig. 7A.—The outline of stomach as given by the movements of the light flexible cable.

Fig. 7B.—The outline given by the movements of the less flexible cable.

from these appearances, incompatible with complete recovery from the gastric dilatation, as well as the *gastropptosis*, had the patient's strength been equal to the surgical ordeal. The case tends to show how slight may be the impediment which leads to these fatal results."⁴¹

THE GASTRIC MUCOSA.

The examination of stomach contents obtained by use of the gastric tube marked an epoch in the diagnosis of diseases of the stomach and intestines. The stomach contents inform us of normal and pathologic secretion, and food remnants contained in the contents give information as to the approximate degree of the motility of the stomach. Material lying freely in the cavity of the stomach is easily removed by means of the ordinary tube; the mucus adherent to the walls of the stomach in pathological conditions is only obtained with greater difficulty, if at all, in the ordinary methods. Beaumont has demonstrated the presence of this adherent mucus in the person of St. Martin. He found it particularly in "catarrhal" inflammations of the stomach.

Ewald (*Loc. cit.*) recommends lavage of the stomach for the purpose of "loosening the mucus which adheres

to its walls, partly chemically and partly mechanically," but, as stated, this was advised for therapeutic purposes.

Boas (I. Boas zur Symptomatologie des Chronischen Magen-katarrhs und Atrophie der Magenschleimhaut, *Munch. Med. Wochenschrift*, 1887, No. 42.) differentiated between the mucous form and the atrophic form of gastritis, which was a decided step in advance.

Fig. 8.—Duodenal sound with spiral end.

Einhorn (Dis. of the Stomach, N. Y., 1896), in his description of pathologic anatomy of chronic gastritis, states: "The mucosa is usually covered with a thick layer of tenacious mucus, presenting a yellowish-gray or slate color," but this refers more to the pathologic findings postmortem, and mention is not made of this as a diagnostic feature during life. Only the stringy mucus that is free in the gastric cavity and found on removal of the stomach contents by the tube, is considered; when mucus is not found in the gastric contents, it is differentiated as one of the other forms. The former condition is termed "gastritis chronica mucosa."

I reported an interesting case in 1893, of a man who suffered from periodic attacks of great flow, not of

membrane is coated by the adhering and tenacious mucus, associated with pathologic changes in the mucosa.

Hemmeter³⁴ (p. 394) states: "The epithelial surface is in the various forms of gastritis, covered with a tough, glassy mucus, epithelial detritus, and sometimes pus."

It must be admitted that the question whether material removed from the stomach and consisting of mucus, food remnants, epithelia, leucocytes and bacteria had been lying loosely in the stomach or had adhered to its walls, is extremely hard to answer, if possible at all, but it is of the greatest diagnostic importance. Of like importance is the determination of the particular area of the stomach mucous membrane from which the material was derived. The diagnostic significance is not confined to the cellular elements and food detritus contained in the tough mucus, but a study of the nutritive variations of the culture-media will often determine the character or grade of infection. I have rarely been able, even by the prolonged use of the gastric needle douche under considerable pressure, to wash off the

Fig. 9.—Duodenal sound before introduction.

Fig. 10.—Duodenal sound after introduction with silk threads drawn taut.

gastric juice, but glairy mucus. Between attacks but little mucus could be found. Many of the cases where mucus is found free in the cavity may be due to neuroses and other general conditions. (*North American Practitioner*, May, 1893.)

Leube, Penzoldt, Riegel and others have recognized, chiefly by the postmortem findings, that the mucous

Fig. 11.—Duodenal sound in situ.

mucus covering the stomach wall. If, however, the fasting stomach is first thoroughly douched until the cavity is free from material, and the waste water runs off clear, and then the flexible, revolving sound is introduced and rotated, the adherent mucus masses are gently loosened and brought out. The region from which it is desired to remove this material can be readily determined by external palpation of the revolving sound

within the stomach. Before the revolutions of the sound can be felt externally, it is necessary that the end of the sound must have come in close contact with the mucous membrane from which the mucus is removed and found upon withdrawal of the instrument. The material thus obtained can then be used for examination. If it is desired to obtain material directly from a certain region of the stomach—for instance from the fundus, or greater or lesser curvature—the gyromele sound is introduced through a double stomach-tube. The cable passes through the wider tube while a strong silk thread is passed through the narrow tube. The thread is attached to the end of the longer tube which carries the cable. Upon traction of this silk thread, the cable can be directed to any selected area. By these methods we are enabled to make extensive chemic, microscopic, and bacteriologic studies of the stomach. I have used these methods constantly and successfully in my private clinic.^{1 3 4 5 6 14 18}

cially since these conditions vary greatly in different individuals. However, before the sounding of the pylorus is proceeded with, the situation, size, distensibility, etc., of the stomach must be correctly determined. Inflation of the stomach with air greatly facilitates the sounding, because the end of the sound glides more easily along the distended than the collapsed walls. The sound having passed the pylorus, the air is allowed to escape from the stomach and this organ resumes its former shape. When the sound turns through the antrum pyloricum toward the lesser curvature, a procedure which can be palpated externally, it is withdrawn slightly, whereupon the end of the sound enters the antrum. The rotations of the cable are continued while the sound is cautiously pushed forward, and the latter can then be palpated, having assumed the S-shaped curve of the duodenum. At this time it is possible to aspirate the duodenal contents through the cable tube, which convinces of the presence of the end

Fig. 12.—Palpation of the vibrations of the rotating cable within the stomach and outlining the contour upon the abdominal wall. (From the author's private clinic.)

PYLORUS AND DUODENUM.

In sounding the pylorus and duodenum with the gyromele, a more flexible cable is used, which terminates in an exceedingly flexible and elastic steel spiral. (Descriptions of the apparatus and its use were published in 1894 and 1895.)^{1 2 3 4 8 9 14} The object of the spiral end is to give the sound greater adaptability, combined with a certain degree of resiliency. These qualities enable the sound to more easily adapt itself to the anatomical conditions, which is very desirable, espe-

of the sound in the duodenum. Transillumination with the x-rays, gives very instructive and convincing pictures.

Instead of the simple rubber tube, the above-described double tube with the silk thread directing the end of the sound can be used. I have also devised an instrument in which the silk thread is in the same tube with the cable. (Figs. 7 and 8.) Upon traction of this thread, after the sound has reached the greater curvature, a double curve of the sound is effected, which directs its

end with ease into the pylorus. (Fig. 10.) Not all cases require duodenal sounding, but in many of them this exploration is not only of value, but indispensable for differential diagnosis, as the following cases will illustrate:

means of the gyromele revealed a patulous, easily passable pylorus and no duodenal obstruction. The *x*-rays confirmed these findings. The patient was treated for myasthenia, and had gained 14 kg. at the end of six weeks. The last reports confirmed the diagnosis.

Fig. 13.—Colon sound.

CASE 6.—Dec. 5, 1893, J. J. O'C., was sent to me with a diagnosis of carcinoma of the pylorus. The general symptoms of this disease were more or less evident. Thorough sounding of the pylorus and palpation combined therewith excluded a carcinomatous affection of

TECHNIQUE.

The technique of sounding by means of the gyromele is simple and easy. The cable is introduced in almost the same manner as the ordinary stomach-tube. Some experience is required to locate the fundus, greater

Fig. 14.—X-ray of the duodenal sound in situ. The stomach is enormously dilated and markedly myasthenic, which accounts for the extraordinary excursion of the stiff cable, and the stomach is thereby displaced to the left.

this organ. After a comparatively short treatment, the patient gained more than 10 kgs. This patient has not shown any gastric symptoms since 1894.⁴

CASE 7.—Another case is that of Dr. C. L. C., who was sent to me with a suspected stenosis of the pylorus, by Dr. Murphy. There existed in this patient an enormous dilatation of the stomach, great emaciation and debility; weight 54 kg. Sounding of the pylorus by

curvature, pylorus and lesser curvature with certainty, but even the inexperienced find the introduction of the thin cable, covered with rubber tube the thickness of which reaches at the most 5 to 6 mm., and armed with the soft cotton tampon or sponge, easier than the introduction of the thicker and flabby stomach-tube. This is particularly the case with patients unused to intra-gastric methods. The steel sound serves here the same

purpose as the formerly much-used "mandrine" of the Germans, but because of its greater flexibility and elasticity, it conforms more easily to any intervening curves.

The rotating cable is covered the distance from mouth to cardia with a rubber tube. In this tube, the cable moves freely, and thus little friction is caused. Since this surrounding rubber tube remains stationary, a pushing to and fro of the cable is unnoticed by the patient. As soon as the tampon on the end of the cable has reached the greater curvature, it meets slight resistance, the cable bends, and the end glides along the greater curvature until at the antrum pyloricum, or lesser curvature, it again meets resistance. Now, the stomach is moderately inflated with air and the cable pushed slowly forward; its end now turns—as has been observed by the *x*-rays—toward the left and upward along the lesser curvature. Thus the cable is seen to describe an irregular circle, influenced by the contour of the stomach. Pushing the cable still farther into the inflated stomach, it will bend into the fundus, there adapting itself to the dome thereof. All of these phe-

of sounding the stomach and duodenum. It is therefore unnecessary to dwell especially on the sounding of the colon, and hence, I only mention it here.

X-RAYS.

By the use of the *x*-rays for transillumination of the body, diagnosis by means of the gyromele cable combined with palpation is made more certain and easy. The first attempts to observe the introduced sound *in situ*, with the aid of the *x*-rays, were made by me in the spring of 1896. The degree of density of the steel sound is seen to interrupt the rays and give a distinct contour of the sound. In May, 1897, I demonstrated the transillumination of the body with the sound introduced and put in motion, before the Illinois State Medical Society,³⁰ and I have since repeatedly called attention to the importance of this procedure. Different substances contained in stomach and other rubber tubes, as mercury, bismuth salt emulsion, etc., have been used with the intention of making the contours visible during transillumination with the *x*-rays. The visi-

Figure 15.

Figure 16.

nomena can be observed with as much certainty by external palpation and auscultation of the rotating cable end, as with the *x*-ray. This holds true, even of those parts which are covered by the left lobe of the liver or by the ribs. (Fig. 12.) By following the rotations of the cable end with a skin pencil the contours of the stomach are drawn upon the abdominal surface. In lean individuals the rotations may be perceived by inspection; in fat subjects, it is advisable to put the cable in more accelerated motion, in order to palpate the rotations. Variations in diameter of the stomach walls influence the degree of the vibrations considerably, and I have been often able to convince myself of this fact postmortem, as reported. Determination of the various grades of thickness, tension and tonus of the gastric walls is arrived at by sounding with cables of various strengths. The observed curves of distention give, in comparison with each other, the desired information.

In sounding the sigmoid flexure through the rectum, different circumstances had to be considered, and for this purpose a modification of the gyromele was required. (Fig. 13.) The technique of sounding is similar to that

bility and accuracy of these contours, obtained after introduction of my steel cable, can be observed in the accompanying half-tone illustration. The clearness of the picture has been somewhat impaired by its reproduction. The solid cable is plainly visible as a sharp line, while the hollow spiral end is represented by a more indistinct shadow; in fat and old individuals it is often impossible to distinguish the spiral at all. It is extremely interesting to observe the excursions of the rotating cable with the aid of the *x*-rays or the entrance of the end of the cable into the pylorus or duodenum. I have often found the borders of the stomach, previously marked by lead roll fastened upon the abdomen, confirmed by transillumination. The ensiform appendix and umbilicus were marked with metal buttons, and their position was also confirmed.

Measurements were made by graduating the cable with lead shot. All those experienced in the *diagnostique* of the stomach and intestines will readily appreciate the value of this method. It is easily seen, when applying bismuth salt emulsion, by means of the gyromele, that the walls of the stomach and esophagus

become thoroughly coated with a stratum of the emulsion.^{1 7 9 30}

BACTERIOLOGY.

What has been said in regard to the removal of material from portions of the mucous membrane for pathologic examination will give a clear idea of the method used in taking cultures for bacteriologic examination from any selected portion of the gastric mucosa, without contamination from the mouth, esophagus, or other portions of the stomach.

The cable is enclosed in a tube and the end covered with a rubber cap (Fig. 15) which is attached to a string that passes outside along the tube, and when the desired point is reached the cap is pushed off and withdrawn. (Fig. 16.) After a culture is taken from the walls, the cable is drawn into the tube again and the instrument withdrawn from the stomach.

A portion of the rubber end of the tube is then cut off to prevent contact of the sponge with any material which might enter it as it is being withdrawn. The sponge is then pushed out and inoculations made in the usual manner. I have used in special work, requiring great accuracy, a second outside tube that reached to the cardia only. This forms a protection sheath to the above-described tube that is pushed into the stomach. For practical purposes, the simpler method is sufficient.

It is not possible to make accurate bacteriologic investigation of any kind where contamination takes place. This is one of the chief principles upon which modern bacteriology rests. A stomach-tube introduced into the stomach and the stomach contents examined for bacteria gives no scientific data of the flora of the stomach. The micro-organisms in the lumen of the stomach, mixed with food, are transient and, without a constant factor, we can make no accurate deductions. The colonies develop upon the walls of the mucosa, in the bed of mucus, food detritus and exfoliated cells, which adheres with glue-like tenacity. This furnishes an opportunity for bacteriologic examination if we can secure such material uncontaminated. I have already referred to my studies of the gastric flora under various pathologic conditions.^{1 3 4 6 11 12 16} The normal stomach, as previously shown, does not permit germs to develop upon the mucous walls, although germs may be found free in the lumen. From a series of experiments upon dogs, my conclusions were that gastritis is caused chiefly by the growth of a variety of germs that develop upon the walls of the stomach; the type of inflammation was not dependent on special forms, but on the groups that predominated. I have verified the accuracy of these methods by cultures taken from the walls of the mucosa during operations for gastrectomy, gastroenterostomy and pylorotomy. Gehrman,⁴⁴ referring to the use of the gyromele in bacteriology, states: "It is apparently the only way of attaining definite data as to bacteriology of the stomach."

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4. Turck: The early diagnosis of carcinoma of the stomach, with the bacteriology of the stomach contents. JOURNAL AM. MED. ASSN., March 2, 9, 16 and 23, 1895.

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Presentation of a case.

"On examination we found the stomach to within one inch of the umbilicus." Removal of material adhering to the stomach walls for microscopic examination. Therapeutic value of gyromele especially in muscular weakness without stenosis. Importance of obtaining more definite information of processes going on in stomach and intestines. Differential diagnosis between muscular atrophy of stomach and achylia gastrica.

7. Turck: Methods of diagnosis and therapeutics of diseases of the stomach and intestines. JOUR. AM. MED. ASSN., June 22, 1895.

General consideration of various diagnostic methods. Determination of distensibility of the stomach by means of introduction of cables of different degrees of flexibility, by use of the gyromele. Determination of condition of esophagus and cardia. Removal of material from mucosa for microscopic and bacteriologic examination. Differential diagnosis between functional disturbances and atrophy of the stomach. Various therapeutic procedures.

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10. Reed: The importance of protecting the stomach and intestines from pathogenic germs. The Annals of Hygiene, August, 1895.

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The value of investigation of the stomach and intestines especially by the use of the gyromele: "Such methods are applicable to a considerable extent throughout the intestinal tract."

13. DaCosta: Medical Diagnosis. Lippincott & Co., Phila., 1895.

14. Turck: The etiology and pathology of gastritis upon which is based rational therapeutics. The Chicago Clinical Review, Jan. Feb., 1896.

Sounding of the stomach and pylorus: Degree of gastric myasthenia measured by cables of different degrees of flexibility. Food adherent to stomach walls due to glue-like consistency and to motor insufficiency of stomach. Lumen of stomach free from food, which adheres to the wall, found by gyromele, makes the diagnosis of gastric myasthenia positive. Bacteriologic examination of stomach. Bacteria classified.

15. Turck: The double stomach-tube. *JOUR. AM. MED. ASSN.*, Jan. 11, 1896.

Description of the double tube (also in No. 78-9) with a rubber bag attached, used in connection with the *gyromele*. Value of the apparatus for diagnostic purposes. The double tube with attached bag and cable within the tube is introduced into the stomach. The bag is located in the stomach by palpating the abdomen while rotating the *gyromele* through one side of the double tube. The bag is inflated and the distance of the cardia greater curvature and lesser curvature can be measured. The degree of muscle tonus is estimated by injecting water into the bag in conjunction with air, or without air. Determination of the location of the bag within the stomach is made by palpation of the vibrations of the revolving sound as well as by percussion.

16. Turck: The Improved *Gyromele*. *N. Y. Med. Jour.*, Feb. 8, 1896. The flexible cable is covered with a tightly fitting rubber tube, which passes through a short outer tube or sheath which reaches to the cardia only and remains stationary. The revolving cable rotating within the outer tube may be pushed back and forth, thus reaching all parts of the stomach.

17. Wesener: *Centralblatt für Physiologie* (Abstr.), Bd. x, No. 1, April, 1896.

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21. Kuhn: Sondierung des Pylorus am lebenden Menschen vom Munde aus. *Muench. Med. Woch.*, No. 6, 29, July 21, 1896.

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26. Turck: Experimental and clinical observations on erosions of the stomach. *Ft. Wayne Med. Jour.-Mag.*, Jan., 1897.

27. Kuhn: Sondierung am Magen, Pylorus und Dünndarm des Menschen. *Archiv f. Verdauungskrankheiten*, Bd. iii, Heft 1, 1897.

28. Hemmeter: Die Priorität der Pylorussondierung. *Centralblatt f. innere Med.*, 1897, No. 2.

29. Turck: Modern Methods of Treatment of Diseases of the Intestines. *N. Y. Med. Jour.*, March 20, 1897.

30. Turck: Explorations with the *gyromele*. Methods of physical examination of the stomach and intestines by the aid of the *gyromele*. (Demonstration on Patients.) *Trans. Ill. Med. Society*, 1897.

31. Ferguson: A case of gastrostomy. *Chic. Med. Recorder*, Vol. xlii, No. 1, July, 1897.

32. Boyd: The significance of dilatation or gastrectasia in functional and organic diseases of the stomach. *British Med. Jour.*, July 31, 1897.

33. Hershey: A contribution to the Pathology, Diagnosis and Treatment of Gastric Disorders. *Colo. Med. Jour.*, Aug., 1897.

34. Hemmeter: Diseases of the Stomach, 1897. Philadelphia, p. 642. Description of method of sounding the duodenum.

35. Hare: Practical Diagnosis. Philadelphia, 1897.

36. Ewald: Diseases of the stomach. American Translation. 1897.

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37. Turck: Diagnosis and treatment of diseases of the duodenum by direct methods. *JOUR. AM. MED. ASSN.*, July 30, 1898.

38. Turck: Die Priorität der Sondierung von Oesophagus, Magen und Darm mittelst der *Gyromele* (biegsamen revolver Sonde). *Centralblatt f. innere Med.*, No. 8, 1898.

39. Turck: A demonstration of intragastric instruments. *British Med. Jour.*, Dec. 24, 1898, p. 865.

40. Von Valzoh-Nesbitt: The diseases of the Stomach. Phila., 1898.

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42. Turck: "Motor insufficiency of the stomach," with exhibition of cases before the Chicago Medical Society. *The North Am. Practitioner*, Vol. xi, No. 2, 1899, in which the *gyromele* was used in the stomach and duodenum.

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A NEW OPERATIVE METHOD TO EXPOSE THE SEMINAL VESICLES AND PROSTATE FOR PURPOSES OF EXTIRPATION AND DRAINAGE.

A PRELIMINARY REPORT.*

EUGENE FULLER, M.D.

Professor of Genito-urinary and Venereal Surgery at the New York Post-Graduate Medical School; Visiting Genito-urinary Surgeon to the City Hospital.

NEW YORK CITY.

The extravesical incisions heretofore employed to expose the prostate and seminal vesicles are the Von Dittel, the Zuckerkandl and the Kraske.¹ In my book on diseases of the genito-urinary system, recently published,² I have fully detailed these operations, consequently in the present connection little attention will be paid to them aside from citing their surgical shortcomings.

In all these operations the trunk of the patient lies horizontally. In the Zuckerkandl operation the ordinary lithotomy position is maintained. In the other two the patient lies on the abdomen, the thighs hanging vertically downward over the edge of the table. The space afforded by the Zuckerkandl incision is too limited to allow a surgeon to do any accurate work in connection with organs so deeply situated as the seminal vesicles. The operation is bloody and tedious, numerous vessels having to be ligated in inaccessible positions. Both the Von Dittel and the Kraske operations are lateral ones, consequently only the right or left seminal vesicle and corresponding side of the prostate, as the case may be, are well exposed during a given operation. The Von Dittel operation was designed especially to expose the prostate, and it also does not serve the purpose of exposing sufficiently the region occupied by the seminal vesicles. Besides being unilateral the Kraske operation is formidable, owing to the extent of the muscular structures, the division of which its performance necessitates. When the seminal vesicles and prostate are in this manner exposed, they lie at the bottom of such a deep wound that Redygier, in order to satisfactorily manipulate them, found it necessary to make the operation still more formidable by advocating a transverse cut across the sacrum just below its third foramen.

Although I have had considerable personal experience with these operations in exposing the seminal vesicles, I have found them all very disappointing, and this has led me to originate the procedure which I am now to report, and which I have found eminently satisfactory. After describing my method in detail, I will report five cases in connection with which I have practiced it. These five represent my experience up to date, with the operation. The method is as follows:

In the first place it must be remembered that the perineal and pelvic structures to be submitted to operation are soft, yielding and elastic. In order to facilitate an accurate dissection through such tissues they should be made to assume as stable a position as possible, and that can only be accomplished by putting them on the stretch, thus making them taut. This can be accomplished by flexing the thighs sharply, as in the extreme lithotomy position. The patient with his thighs so flexed is put belly downward on a Trendelenburg

* Read before the New York County Medical Association, Feb. 18, 1901.

1. In this connection mention should be made of the interesting surgical work of Dr. Hugh Young, of Baltimore, who has on two or more occasions exposed and removed the seminal vesicles by opening the abdomen and flexing the bladder forward.

2. The Macmillan Co., New York, 1900.