The merit of having organized a service of public assistance, in the true modern and philanthropic sense of the word, belongs to Antoninus Pius, who acted, I am sure, under the indirect pressure of Christian influence and charity, the new faith having made immense progress in Rome under his wise, temperate rule.

The new sanitary codex comprised the institution of head-physicians (archiaters) in every inhabited centre, and a set of rules for the medical service in the largest cities of the empire. These medical officers had to be elected by the town council, and to be approved by the *patres-familia*. In progress of time, the election had further to be sanctioned by the College of Physicians practising in the same town, and even by the Emperor himself. The assistance to the poor was compulsory and gratuitous.

Such are the results of the campaign thus engaged in by the Romans against malaria, and fought with the means I have endeavored to describe, one by one.

Original Article.

A CASE OF GASTROTOMY. DIGITAL EXPLORATION OF ŒSOPHAGUS, AND REMOVAL OF PLATE OF TEETH. RECOVERY.¹

REMARKS UPON THE OPERATION, AND OBSERVATIONS UPON THE ANATOMY OF THE ŒSOPHAGUS.

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MANY cases have been recorded where foreign bodies have become lodged in the œsophagus. The most common seat of impaction or lodgement is the very beginning of the tube, at the level of the cricoid cartilage, where its calibre is less than at any other point. It is at or just above this point that smooth and rounded bodies become checked in their course. When their diameter exceeds that of the distended œsophagus they are either regurgitated or produce death by impediment to the air-passages. If a smooth body once passes the first constriction of the œsophagus, it meets no further resistance until the opening in the diaphragm is reached. This is usually passed because the diameter at this part is greater than at the first constriction. When, however, the body is angular, irregular, or with sharp points it is much more likely to become impacted at these natural constrictions, though it may become arrested at any part in the tube, its sharp points catching in the mucous membrane.

The symptoms which follow the impaction of a foreign body in the œsophagus, may be very slight, so that little attention will be paid to them by the patient. We may observe pain, dysphagia, suffocation, spasms, alterations in the voice, cough, expectoration, deformity, or none of these may be present.² The immediate symptoms depend upon the shape and size of the body. Pieces of meat may be large enough to produce suffocation, and this is not uncommon in old people who have lost their teeth. Immediate pain may be caused by laceration of the walls of the œsophagus by sharp points or by the pressure of a large body. It may be said that the immediate

symptoms are not severe and rarely cause death. Subsequently we may have inflammatory conditions, ulcerations, hæmorrhage, starvation or tolerance of the foreign body.

The inflammatory changes which may follow are œsophagitis or pericœsophagitis with formation of abscess. The body may become detached in this way. The abscess may break into the œsophagus or outwardly, or into a neighboring organ. Ulceration may extend into the trachea and bronchi or it may erode a bloodvessel and cause death by fatal hæmorrhage, or by asphyxia. The pleura or pericardium may also be perforated. Death rarely follows primarily, but is generally due to the secondary changes mentioned. A foreign body lodged in the œsophagus, when natural efforts have failed to dislodge it, must either be extracted, pushed down into the stomach or cut out, or it must be left to itself and palliative measures adopted.

Œsophagotomy is to be resorted to only after all other means have failed. Up to the present year this method has been the last and only resort, and it has afforded relief only in those cases where impacted bodies have been within reach from the external incision in the neck.

The possibility of reaching the œsophagus from below has been alluded to by several writers, and œsophageal strictures have been treated instrumentally after the stomach has been opened for purposes of alimentation. Prof. Loreta, of Bologna, in a monograph published in 1884³ mentions cases of gastrotomy not only for digital dilatation of the pylorus but also for division of œsophageal stricture. He gives four cases with recovery in which a small opening was made in the stomach, instruments passed into the œsophagus, and the stricture divulsed. The operation was completed by sewing up both stomach and abdominal wound. Bergmann and Schattauer have succeeded in passing bougies through a stricture of the œsophagus from below. Wentlechner has passed a delicate sound down through the stricture and out of the opening in the stomach. He also attached a thread to the lower end of the sound and by means of it drew up after it larger instruments, drainage-tubes, etc.⁴ Von Hacker⁵ did a similar operation and obtained a good result in a cicatricial contraction of the œsophagus by the introduction of a Nélaton catheter stretched over a whalebone guide. In a letter to Dr. Randolph Winslow, of Baltimore, he mentioned two cases in which the operation of dilatation by the use of drainage tubes attached to filiform bougies had been performed, in one of which he states that the operation had already been successful, and the other had been but recently performed at the time of writing.⁶

In these cases advantage has been taken of the gastric fistula already existing to approach the œsophagus from below, or a small incision has been made into the stomach for the introduction of bougies or divulsors of small diameter.

I can find no recorded cases where the œsophagus has been explored with the fingers, the hand being introduced into the stomach.

The experience gained in the following case with an experimental study of the anatomy of the parts concerned, convinces me that this surgical procedure

¹ Read at the Meeting of the Suffolk District Medical Society, Section for Surgery, November 3, 1886.

² Poulet. *Foreign Bodies*, Vol. 1.

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³ See Review by Ancona in *Archives Gén. de Médecine*, 1885, ii p. 318.

⁴ Philadelphia Med. News, September 4, 1886, p. 267.

⁵ Von Hacker. *Ueber die Magen-Operationen*.

⁶ Dr. R. Winslow in *Philadelphia Med. News*, September 25, 1886, p. 360.

may be undertaken in many cases where operative measures have hitherto been considered out of the question. In twelve subjects I found the distance in a straight line from the centre of an incision five inches long, one inch below and parallel to the margin of the ribs on the left side, beginning at the outer border of the rectus abdominis to the œsophageal opening in the diaphragm, to be 7.55 inches. Through an incision of five inches in the anterior wall of the stomach the hand and forearm could easily be passed and the index and middle finger introduced through the diaphragmatic opening their whole length, about two and a half inches. There was some difficulty at first in finding the cardiac opening, but this was very soon overcome.

The best method of introducing an instrument into the œsophagus is as follows: The cut in the stomach should be made at the point which presents itself most naturally at the centre of the abdominal incision, that is, about four inches from the pylorus. The assistant makes tense the lesser curvature by traction with the thumb and finger downwards, forwards and to the left. The lesser curvature is thus straightened out and the mucous surface of the stomach corresponding to it is formed into a sort of groove, along which the instrument glides directly into the cardiac orifice. To do this easily one must accustom himself to the operation by repeated experiments upon the cadaver. Great assistance can be gained by finding the diaphragmatic opening outside the œsophagus, with the left hand. I was able in this way repeatedly to grasp coins placed in the œsophagus beyond reach of the fingers by means of forceps. In cases of foreign bodies the œsophagus should be examined before the stomach is opened, for it may be possible thus to dislodge them. A small incision should then be made into the stomach through which efforts may be made to remove the body by means of instruments. Later this may be enlarged enough to admit the hand. It is important to ascertain as accurately as possible the position of the foreign body with reference to the opening in the diaphragm, not only that we may be sure it is within reach of the finger from below, but also that we may know its relations with other organs.

At the diaphragm the œsophagus is not in contact with the pleura, and it is not so closely related to the aorta behind. A foreign body impacted here would not be in such close relations with important structures, and the danger from ulceration and perforation would be less. This fact would have weight in deciding upon a palliative course of treatment. Moreover, an abscess at this point would most naturally drain into the stomach. Two inches higher up, the œsophagus is directly in contact with the heart in front, the aorta behind, and the pleural cavities on each side.

The danger of erosion of arteries, perforation of the pleura and pericardium, abscess of the mediastinum, etc., would be very much greater than at the diaphragm and we might not feel ourselves justified in waiting. Finally, it may be demonstrated that the body is beyond the reach of the finger and the surgeon will then be called upon to decide whether it is better to open the stomach for the purpose of using instruments of traction, or to attack from above by œsophagotomy.

The following table gives the measurements of the distance from the upper incisors, when the head is

fully extended, to the opening in the diaphragm, as well as the measurements referred to above.

No.	Height. Ft. In.	From Incisors. In.	From Abdominal Cut. In.
1	6	14½	Not Taken.
2	4 3 (deformed).	10½	"
3	6 4	15	8½
4	5 7½	16½	7½
5	5 6	15½	8½
6	5 3½	15	7½
7	5 4	15½	6½
8	5 7	15½	7½
9	5 5½	15½	7½
10	5 6	16½	7½
11	5 7	16½	8
12	5 4	15½	7
13	4 10	15½	7½
14	5 ½	14	8½
Average	5 5	15	7.55

From these figures it may fairly be said that a foreign body may be reached with the finger from below, when its distance from the incision, determined by the probang, is not less than thirteen inches. In a cadaver in which this measurement was fifteen and three-quarters inches, I was able to touch, grasp, and remove with my fingers a silver quarter-dollar situated twelve and one-half inches from the incisors. This was repeated several times with larger coins, silver half-dollars and dollars.

A glance at this table will show that the distance from the incisors to the diaphragm does not bear a constant ratio to the height. A man of six feet measured fourteen inches, while another of four feet ten inches, measured fifteen and one-half. Without regarding the height we may say that the average distance is about fifteen inches in fourteen subjects taken at random.

Since reading this paper and hearing Dr. Cheever's remarks in regard to the distance he could reach down the œsophagus in his cases of œsophagotomy, I have dissected with special reference to this point. I find that in a female subject with a measurement of fifteen and three-fourths inches from incisors to diaphragm, not only can the aorta be reached easily after left œsophagotomy in neck, but the finger can be hooked under the arch. When the left index was in contact with the lower disc of a silver dollar in the œsophagus, the right middle finger introduced from above through the neck, could very easily be made to touch the upper. It was next found practicable to pass a half-dollar from one hand to the other, and finally the *fingers* were made to touch each other. In four other subjects these experiments were repeated and the fingers could be brought in contact with ease.

From these observations I think it may be asserted that *there is no part of the human œsophagus which may not be reached, or very nearly reached, with the finger either by gastrotomy or by œsophagotomy.* Also that with the finger as a guide instruments may be used with intelligence upon any part of the canal.

The following unique case illustrates clinically the truth of some of the anatomical observations recorded above. It should be said, however, that these facts were not known at the time of the operation, and it was not thought to be at all certain that the foreign body was within reach of the fingers. Preparations were made beforehand for the use of a long forceps both for crushing and for tractions, and it was even thought that the lithotrite might be necessary. The case illustrates also the remarkable tolerance of the œsophagus at times. As will be seen, a grave

complication already existed without giving any sign of its presence, namely, a periœsophageal abscess which the manipulations of the operation caused to break into the lung. The other symptoms present, pain and starvation, in themselves rendered the operation imperative. The facts made known by the operation and subsequent history prove that if a much earlier attempt at removal had been made, the danger of inflammation and starvation would have been avoided and the chance of recovery from the operation itself would have been better.

John McCarty, thirty-seven years of age, six feet one and one-half inches high, very robust, teamster, came to the medical room of the Out-Patient Department of the Massachusetts General Hospital, September 26th, 1886. He was referred to me as out-patient surgeon. He said that three days before, while eating he had swallowed his false teeth. He described the plate as being about the size of a silver half-dollar carrying the four anterior teeth of the left upper jaw, and as leaving two small hooks by which it was fastened to the teeth still left in that bone. I passed a small ivory probang into the œsophagus and detected the foreign body easily. It was situated far down in the tube apparently near the stomach. He was recommended for admission and was assigned to Dr. Beach.

On entrance he felt weak and complained of pain under the sternum between the nipples. There was also a little soreness on pressure. Had some pain in taking a long breath. Swallowed liquid food. Two days later felt better; was examined by Dr. Beach. An ivory-tipped probang struck against a hard body apparently just above the cardiac opening of the stomach. A good-sized stomach-tube passed by the teeth. A coin probang was caught under the plate. On pulling, the end broke off.

September 29. Consultation of surgeons decided against operation.

October 3d. One week after accident was able to take soft food well.

October 7th. Passed end of probang *per rectum*.

October 23d. Had some pain and soreness apparently at the pylorus. Some nausea. A stomach-tube was passed into the stomach without obstruction. Was given charpie cut fine mixed with white of egg.⁷

November 10th. Was improving in health and strength. Had good appetite and less pain.

Discharged, to report if he has any trouble.

December 3d. Reported that he felt comfortable: had not passed teeth.⁸

Patient re-entered hospital July 23d, 1886. Says he has been losing flesh since leaving the hospital, and now weighs one hundred and thirteen pounds, about sixty-five pounds less than before accident. He has considerable soreness when he swallows, and at times is unable to retain any food. He is very much emaciated, though his health is good.⁹

I examined again with the ivory probang, and found a foreign body exactly in the same spot as the year before. His condition at this time was quite deplorable. From a robust and strong man, whose normal weight was one hundred and eighty pounds, he had become extremely emaciated. It was with great

difficulty that he could swallow enough liquid food to keep alive. Solid food could not be taken at all. He complained of constant and severe pain in the epigastrium, and in the back. From the date of entrance until August 5th he was carefully observed. It was found that the probang came in contact with the foreign body just fourteen inches from the incisor teeth. As nearly as could be estimated, this would make their position about two inches above the line of the nipples (see Fig.), and some little distance

From a photograph taken 3 months after operation. The plate is suspended on the chest wall to show as accurately as possible its location when lodged in the œsophagus. The distance from the plate to the centre of the abdominal incision is 12 inches. As the stomach was drawn out of the abdominal wound two or three inches the distance from the opening in the stomach to the foreign body was at least 12 inches.

above the cardiac opening of the stomach. In this position, the plate, with its sharp edges, would lie between the heart in front, and the thoracic aorta behind, and separated on either side from the pleura by the thickness of the œsophageal wall.

After careful consideration of the case, I advised that an attempt be made to remove the plate by opening the stomach. The patient gladly consented. For two days before the operation nothing was

⁷ See Poulet, Vol. 1, p. 158. Case in which the irregularities of a plate of teeth, lodged in stomach, were covered and concealed after a diet of oakum and raisins continued one week. Expulsion from rectum with oakum adherent and irregularities thereby smoothed.

⁸ Mass. Gen. Hosp. Records, Vol. 219, p. 200.

⁹ Mass. Gen. Hosp. Records, Vol. 226, p. 80.

taken into the stomach, except water and stimulants, food being given entirely by enemata. It was not practicable to wash out the stomach, because of the difficulty in passing a stomach-tube by the obstruction.

August 5th, 1886. Patient was carefully etherized. An unsuccessful attempt was first made to demonstrate beyond possibility of a doubt the presence of the foreign body. Some difficulty presented itself in doing this, and the attempt was abandoned to save time. Moreover, it was not essential, as the probang had been used the day before in studying the location of the plate.

An incision about six inches long was made one and one-half inches below and parallel to the margin of the ribs in the left hypochondrium. It began at the outer border of the *rectus abdominis*, three inches from tip of ensiform cartilage, and extended outwards and downwards. The abdominal wall was rapidly cut, layer by layer, until, all bleeding having been stopped, the peritoneal cavity was opened. The abdominal opening was held up by means of a T-hook at each extremity. The stomach was found lying empty in its usual position. An external examination was made of the cardiac orifice and of the whole stomach, to see if the foreign body might not be found and dislodged by manipulations. Nothing could be detected either in the stomach or the diaphragmatic opening. The stomach was now drawn out of the abdominal wound as far as possible, and placed upon a carbolized towel, and in this position all the subsequent manipulations were done. A small incision about one and one-half inches long was first made through the anterior wall of the stomach, beginning near the pylorus, and extending upwards and backwards midway between the greater and lesser curvatures. The walls were very thick and vascular. After cutting through the peritoneal and muscular layer, a dense network of large and tortuous vessels came into view, which, on being divided, bled very profusely. This was controlled by smooth-bladed, hæmostatic forceps.

After two unsuccessful attempts to introduce grasping instruments into the œsophagus through this small opening, I enlarged the incision sufficiently to admit my hand and forearm. The stomach was first wiped out with sponges and held with T-hooks. The walls of the diaphragmatic opening were found with some difficulty after passing the hand seemingly a very great distance. The middle and index fingers were then pushed up the œsophagus between the heart in front and aorta behind until the plate was felt, with the teeth pointing downwards, apparently embedded in a mass of soft granulations. The hand was withdrawn, and long-bladed forceps introduced into the œsophagus, guided by the index finger, but attempts to grasp the plate were unsuccessful. I then re-introduced my hand, and by careful manipulation with the index finger, succeeded in detaching the left extremity of the plate from its bed in the left side of the canal. The other extremity was then loosened from the right side, and the plate passed easily into my fingers, and was withdrawn from the stomach.

The mucous membrane was united with a continuous silk suture, to control the hæmorrhage which followed the removal of the hæmostatic forceps. The peritoneal surface was closed with thirty-six fine, silk sutures, after the method of Lembert, placed three-sixteenths of an inch apart, the line of union being most perfect and beautiful. The stomach was then dropped back

into the abdominal cavity, and the external wound closed in the usual manner with interrupted deep and superficial silk sutures. Iodoform and gauze dressings were applied, with compression. Time of operation, one hour and a quarter.

Although very little blood escaped, the peritoneal cavity was carefully sponged out. "At the end of the operation the patient's pulse was full and strong. At 3 P.M., was having much pain in his side, and was very restless. He complained of cold, and his extremities were chilly to touch. Given brandy freely by rectum. At 5.30, much more comfortable and warm; pulse good. Washes mouth with water, but does not swallow it. Has enema of milk, 3ss, and brandy, 3ss, every two hours." During the afternoon vomited a small amount of blood. Evening temperature, 98°.

August 6th. Very comfortable; given 3i of water.

August 7th. In the morning quite comfortable, except for a slight cough. In the afternoon, he had severe fits of coughing, and after much exertion and distress, would raise 3i to 3ii of thick, tenacious pus. Raised during day about 3viii. Temperature 101.8°.

August 8th. Much better. Raises 3ii to 3iv of pus in twenty-four hours. Began to take whiskey and water by mouth, a teaspoonful every ten minutes. Fed by rectum at frequent intervals. Temperature 99.2°.

August 11th. Stitches removed; wound firmly united.

August 13th. Milk by mouth, 3ss every one-half hour. Some suppuration of stitch-holes, which were enlarged and dressed with a Phenyle pad.

August 14th. 3ii milk, broth, or ice cream every hour. Ale at intervals. Expectoration much less, and cough not so troublesome.

August 19th. Scraped beef, with cracker for dinner.

August 21st. Given solid food in quite large quantities. No pain; scarcely any cough or expectoration. Wound healed.

August 24th. Sits up in bed.

August 27th. Lungs examined by Dr. E. N. Whittier. Dulness, with broncho-vesicular respiration and bronchophony at base of right lung, which accounts for slight elevation of temperature.

September 2d. Walks about ward. 4th. Out in wheel-chair.

September 5th. Weighs one hundred and twenty-one pounds. No cough; signs in lungs disappearing.

September 12th. Weight, one hundred and twenty-seven and a half pounds.

September 18th. Sent to convalescent ward in the country.

October 7th. Returns much stronger. Weight, one hundred and forty-four pounds; no cough.

October 19th. Weight, one hundred and fifty-two pounds.

October 25th. Goes to work as teamster.

November 30th. Weight, one hundred and fifty-nine pounds.

The following are all the recorded cases of gastro-tomy for removal of foreign bodies from the stomach to which any allusion is made by writers on this subject, with a few additional ones which I have been able to collect.

CASES OF GASTROTOMY FOR REMOVAL OF FOREIGN BODIES.

1602. The first authentic case on record in which gastrotomy was done for the removal of a foreign body is that of Florian Mathis, in Prague, surgeon to the Emperor Leopold, who successfully extracted a knife twenty-one centimeters long, from the stomach of a Bohemian juggler in 1602. The knife had remained in the stomach fifty-one days, without causing any great inconvenience or suffering. After the application of plasters, the point of the knife-blade penetrated the pyloric end of the stomach, and was there found and removed. After a few weeks, complete recovery.¹⁰

1635, July 9th. Dr. Daniel Schwabe, of Königsburg, did gastrotomy for the removal of a table-knife eighteen centimeters long and one and a half centimeters broad, swallowed May 25th, 1635, and which had remained in the stomach forty-one days, without causing any essential trouble. A cut was made on the left side beneath the short ribs, the stomach was pierced with curved needles, and the knife drawn out through a cut made upon the knife blade, which could be felt through the walls. The wound in the stomach was left to take care of itself, and the abdominal wound united with five stitches. Complete recovery.¹¹ "This man, Grunheyde, has played many parts, figuring in Schwabe's case, Gruger's, Becker's, Shoval's, and Mentzer's, and referred to by the careless even as Nevin's or Larrey's."

1692. Wesener, in Halle, removed from a boy of sixteen years, a knife, which had remained in the stomach seven months without causing any severe symptoms. Seven months after swallowing the knife, an ulceration broke out three fingers breadths below the pit of the stomach, with marked redness. Six days afterwards spontaneous opening, with fetid pus. Nine weeks later the knife projected from the wound; its point was fastened to the abdominal wall with silk threads. Two weeks later it was entirely removed. Complete recovery.¹²

1720. Hübner, in Rastenberg, removed from a woman a knife sixteen and a half centimeters long, which had been in the stomach eleven days. For three days no disturbance; then sharp pain, and shortly after, the knife point could be felt in the left side. On the eleventh day an incision was made in the left hypochondrium, in the spot where there was evidence of slight suppuration. At this point the knife had penetrated the stomach wall. Recovery in a short time.¹³

1786. Frizac, in Toulouse, removed a knife four and a half centimeters long from the stomach of a porter. An incision was made in the epigastrium, parallel to the linea alba, through which the point of the blade of the knife could be felt, and which had already pierced the stomach wall. The point was grasped with forceps, the opening in the stomach enlarged, and the knife extracted. Two stitches were put in the stomach wound, and one quill suture in the abdominal wound. Healing of the wound and recovery. Baron Larrey was present at this operation, and the case is probably authentic, although it has been overlooked until very recently.¹⁴

1819. Cayroche removed from a woman of twenty-four a silver fork seventeen centimeters long and two centimeters broad, which had been in the stomach two hundred and twenty-nine days. The fork could be felt through the epigastrium, the handle to the right and the prongs to the left. In five months severe vomiting, then pain, emaciation, swelling in the left side as large as a hen's egg. An incision five centimeters long was made over the tumor from above downwards, the rectus abdominus was drawn to one side, and the stomach was opened. The fork was withdrawn times first. Recovery in fifty-one days.

1822. Reynaud, in Grénoble, removed a fork from the stomach of a young juggler, where it had remained thirty-

one days. Gastrotomy was done on the right side of the abdomen, where the foreign body could be felt. Complete recovery. Man still living in 1875.¹⁵

1823. A Dr. L—, endorsed by Sedillot, took a silver spoon from the stomach of a soldier.¹⁶ This may be the same case as that quoted by Credé as follows:—

1823. Bertherand removed a silver-coffee spoon from a cavalry man. It had remained in the stomach one week, and had caused pain there, with swelling of the epigastrium. With the exploring needle a hard resonant body was felt. The cut was enlarged, and the spoon withdrawn with forceps. The stomach and abdominal surfaces everywhere adherent. Simple dressing. Rapid and permanent recovery.¹⁷

1830. Garcia is said to have removed a stick ten inches long from the stomach.¹⁸ This case is considered doubtful.

1836. Fideli, in Riva. A peasant woman, fifty years of age, swallowed a brass fork with four tines, ten inches long without the handle, which remained in the stomach two and a half years. She had terrible pain, sleeplessness, severe cramps, vomiting with every attempt to take food. Fifteen months later an abscess appeared in the right hypochondrium. Two months later a large amount of pus was discharged through the mouth. One month later opening of the abscess outwardly. After repeated closing and breaking out of the wound, the sharp end of the fork appeared. For eleven months the condition continued the same, without the fork protruding any farther. Then for the first time the opening of the abscess was enlarged, and the fork removed. Convulsions followed, with trifling hæmorrhage. For thirty hours' food was discharged through the wound. Fifteen days later it was healed.

1848. Tilanus, in Leiden, removed a silver fork from the stomach of an insane girl thirty-two years old. The fork was twenty-one centimeters long. There was also in the stomach a piece of earthen ware two centimeters long, one centimeter thick, of pyramidal form. Soon after swallowing them she became emaciated and weak, with intense dysphagia. Location of the foreign body made out by palpation. Patient etherized. An incision eight centimeters long, along the linea alba, from a point three centimeters below the ensiform cartilage, was made. The stomach could not be seen, but it could be felt along the left border of the wound. It was drawn forward and fixed with two forceps. An incision two centimeters long was made through the anterior wall of the stomach, and was accompanied by quite severe hæmorrhage. After prolonged efforts, the fork, as well as the piece of earthen ware, was discovered and removed. The wound in the stomach was closed with five sutures, the ends of which were left sticking out of the lower angle of the wound. The abdominal wound was closed with simple sutures, and adhesive plaster placed over all. On the first and second days occasional vomiting of a greenish yellow fluid. Abdomen somewhat painful, tender, and tympanitic. Pulse 100° on the second day, small and weak. Death on the morning of the third day. Autopsy.—Plastic exudation in the neighborhood of the wound. The stomach, liver and abdominal wall glued together. The stomach wound entirely closed. Great dilation of the stomach. The upper third of the œsophagus considerably wounded and perforated in the neighborhood of the larynx. Suppurating sinus near the thyroid gland.¹⁹

1855. J. Bell's case, also reported by T. B. Neal.²⁰ This was a man who, in a drunken fit, in imitation of a juggler, swallowed, on a bet, a bar of lead ten inches long by three-fourths by one-half, weighing one pound, on Christmas day, 1854. Pain, vomiting and gastritis supervened. January 3d, 1855, an incision four inches long was made from the umbilicus to the false ribs, two inches to the left of the median line. An incision was

¹⁵ Credé. Loc. cit., page 586.

¹⁶ Otis. Loc. cit.

¹⁷ Sedillot Contributions à la Chirurgie, 1868. Vol. 2, page 456.

¹⁸ Quoted by Credé, Loc. cit.

¹⁹ Otis. Loc. cit.

²⁰ Credé. Loc. cit., page 580.

²¹ This case has been quoted both by Poulet and by Credé, as two distinct cases.

¹⁰ Otis. Med. and Surg. Hist. of the War, 2d Surgical Vol., page 59. Also Credé, Langenbeck's Archives, Vol. 33, 1886, page 584.

¹¹ Otis. Loc. cit. Credé Loc. cit., page 580.

¹² Credé. Loc. cit., page 584.

¹³ Credé. Loc. cit., page 584.

¹⁴ Otis. Loc. cit.

made into the stomach just long enough to get the bar out. No sutures were put into the stomach itself, the contraction of its walls being sufficient to bring the edges of the wound together. The abdominal wound was closed with sutures. Thirteen days later the wound was entirely healed. February 19th he was about his work.²¹

1856. Glück, in 1856, made an unsuccessful attempt to remove a laryngeal probang which had been accidentally introduced into the stomach.²²

1856. — in Frankreich von? A fork was removed by gastrotomy, with recovery.²³

1857. Bouchet, in Lyons, removed a silver fork from a woman's stomach. Result unknown.²⁴

1858. Hohlbeck, in Wodkinsk. An iron table fork, with wooden handle, twenty-one centimeters long, was swallowed by a peasant with delirium tremens, and remained in his stomach six and a half months. There was pain in the stomach, loss of appetite, nausea and vomiting. There was found in the left side of the peritoneal cavity, between the seventh and eighth ribs, a small fluctuating spot with a fistula, secreting fetid pus, in which the metallic body could be felt. An incision was made at this point, and the fork extracted. The patient died three months later with caries of the sternum and ribs. Autopsy showed complete adhesion of the stomach wound with the abdominal parietes.²⁵

1875-6. Leon Labbé. L., eighteen years, March 30, 1874, swallowed a German-silver fork with five prongs, while imitating a juggler. Had immediate symptoms of asphyxia which suddenly ceased after passing larynx. Fifteen days after there was intense pain and repeated syncope. When this attack had passed, a swelling appeared, corresponding to the point occupied by the greater curvature of the stomach. From this time the patient had alternations of pain and complete freedom from it. His general health became much affected. After some months it was decided to attempt an operation, as the teeth of the fork could be distinctly felt at the limit of the hypochondrium and epigastrium. Caustics were first applied to make the stomach adhere to the abdominal wall, without success. April 9th, an incision was made, and by the aid of forceps, a part of the stomach was drawn through the opening. The fold thus formed was held by a thread. With eight sutures the stomach was fastened to the circumference of the wound. The wall of the stomach was then opened, and with a little manipulation, the fork was removed. Rapid and complete recovery.²⁴

1879. J. C. McKee, America.²⁵ January 15, 1879, a laborer, aged twenty-eight, was playing slight-of-hand tricks with a piece of copper wire, three inches long, which he made mysteriously disappear into his nostril. Suddenly it disappeared into the pharynx and the stomach. Took castor oil without benefit. Worked for two months; then acute pain came on near umbilicus on right side of abdomen, three inches to right below. Tumor gradually formed. Cut down upon the tumor May 4th, and the wire was removed. In this case the foreign body was probably not in the stomach.

1880. Billé's case.²⁶ This patient used a pencil covered by a sponge, and the whole attached to a new silver wire fifty centimeters long, for the purpose of clearing the slime out of his œsophagus. May 2, 1877, it broke off, and part was left in the œsophagus. Billé first did an œsophagotomy at the level of the hyoid bone, but was not able to grasp the wire. Later he did gastrotomy by an incision through the abdominal wall and peritoneum three and a half centimeters long, two fingers' breadth below the margin of the ribs. An incision two and a half centimeters long was made into the stomach, which was made solid with the abdominal wall before incising the mucous coat. The sponge was felt near the pylorus. This was seized with a

pair of forceps and the whole extracted. The upper end of the wire was in the lower extremity of the œsophagus. The whole fragment was thirty-one and five-tenths centimeters long. Patient died five days after operation.

1880. Fleury, L. A.,²⁷ South America, reports the case of a cook who, July 8, 1880, while trying to amuse some children by pretending to swallow a plated dinner fork, accidentally let it slip from his fingers, and felt it passing down into his stomach. There was no inconvenience except slight nausea and vomiting. September 8th, two months later, while jumping a low wall, felt a sharp, stinging pain in the abdomen. The prongs of the fork could be felt distinctly through the abdominal wall. Operation September 14, 1880. A cut three inches long was made in the epigastric region, along the external border of the left *rectus abdominis* at the point where the body was felt. A circular incision was made around the tines of the fork in the stomach wall, and the fork extracted. The handle was in the pylorus and the prongs in the anterior surface of the stomach. Next day patient doing well. Ice water diet. Complete recovery.

1880. Felizet²⁸ removed a spoon from a patient of nineteen. The stomach was first inflated with ether, so as to be easily seen and grasped. Discharged well in three weeks.

1882. Dr. Beattie Bean sent an account of a gastrotomy for foreign body to the *Lancet* from Hong Kong. Ito, a young man, swallowed a tooth-brush. Five days afterwards Dr. Hashimoto, principal of the highest medical college in Japan, was called in. He advised opening the stomach. A cross cut was made, and the stomach laid bare. The brush was found embedded with its sharp handle partly through the walls. It was taken out, and both wounds deftly sewn up. The man was reported to be in a fair way to recovery.²⁹

1883. Kocher, Berne, removed a broken coin-probang from the stomach of a man thirty-seven years old. It had been there one day, and caused hardly any disturbance. An incision was made through the abdominal wall two centimeters below the margin of the ribs. The stomach was opened by an incision three centimeters long, midway between the greater and lesser curvatures, through which the foreign body was extracted. The wound in the stomach was closed with ten Lembert sutures. Recovery without interruption.³⁰

1883. Gussenbauer, Prague. A sword-swallower, nineteen years of age, broke off into his stomach a sword blade twenty-seven centimeters long, two centimeters broad; the broken end was jagged and the point rounded. It remained in his stomach two days. Emetics and suspending by the feet were tried unsuccessfully. On the following day, by sounding and palpation, the foreign body could not be detected. There was fever, vomiting and hiccough. After cutting through the abdominal wall, the point of the sword could be felt wholly in the cavity of the stomach, lying obliquely from above down to the left. After cutting through the stomach wall, the body was removed with little trouble. Death followed in two days from septic peritonitis. The point of the sword had pierced the stomach wall, and the other end had perforated the œsophagus.³⁰

1882. Schönborn, Königsberg, reported at the Congress of German surgeons in Berlin, a case of gastrotomy for the removal of a ball of hair from the stomach of a young girl. She had been in the habit of biting off the ends of her hair, and swallowing them to clear her voice. A tumor was found in the left side of the abdomen, supposed to be at the time either spleen, omentum, or floating kidney. It was found to be a bundle of matted hair lying in the stomach as large as two fists. Laparotomy was performed and the tumor easily found. A long incision was made through the anterior wall of the stomach, and the ball of hair found lying free in its cavity. It was removed, and the stomach wound closed with sixty-five Madelung stitches. Both

²¹ Iowa Med. Jour., Keokuk, 1854-5, ii, 261-266. Also Boston Med. and Surg. Jour., 1859-60, LXI, 489-493. Also Am. Jour. Med. Sciences, 1855, July, p. 272.

²² Otis and Crédé. Loc. cit.

²³ Crédé. Loc. cit., page 588.

²⁴ L'Abeille Med. de Paris, 1876, xxxiii, 161-163.

²⁵ N. Y. Med. Record, xv, June 26, 1879.

²⁶ Berlin Klin. Wochen., 1880.

²⁷ Med. Press. and Circ., N. S., xxxii, 1881, page 321.

²⁸ Deutsch. Med. Zeit.

²⁹ Lancet, 1882, ii, 1014.

³⁰ Crédé. Loc. cit., page 582.

wounds healed by first intention, and patient was discharged in three weeks.³¹

1883. Knowsley Thornton reported a similar case in 1883. That of a young girl of seventeen, who had for some years swallowed the combings of her hair. There was a tumor in the region of her stomach. A transverse incision was made into the stomach to avoid the vessels. The abdominal cut was in the linea alba. A mass of hair nine inches long was removed from the stomach, and the wound closed with fifteen sutures. Next day one sponge was missed. The abdominal wound was re-opened, and the missing sponge found. The patient made a good recovery.³²

1883. Gerard, in Bourguell. A man of thirty years had lodged in his stomach for six weeks a piece of elm-wood twenty-one and five-tenths centimeters long. There was pain, nausea and vomiting. Purgatives were used without success. Six weeks later an abscess appeared four centimeters under the border of the ribs, which was opened, and in the bottom of it the foreign body could be felt. Ten centimeters of it was cut off and removed. He gave forty grammes of castor oil, and the rest of the piece came with the stool on the following morning. Recovery in fourteen days.³³

1885. Billroth. A girl of nineteen years of age swallowed a plate of six teeth. Palpation of the abdomen was painless, and nothing abnormal could be detected. An incision eleven centimeters long, beginning seven centimeters under the ensiform cartilage in the median line, and extending obliquely downward and to the left. After a long search, the foreign body was felt and fixed. It was shoved into a part of the stomach which was drawn forward by two stitches (thread slings). Opening of stomach, extraction, closure with superficial stitches and several Lambert stitches. Stitch of abdominal wall in three stages.³¹

1885. Credé, Dresden. A hair-dresser, twenty-four years of age, swallowed, in his sleep, a plate with eight teeth and two clamps. In the first week there was pain in the pylorus, then nausea, vomiting, sleeplessness, and great excitement. An oblique cut was made, beginning at the ensiform cartilage, parallel to the ribs, twelve centimeters long. Out of this the stomach was drawn. The plate could be felt through the pylorus. A cut was made through the stomach wall, beginning two inches from the pylorus, and extending five centimeters, through which the teeth were removed. The stomach was sewed up with three rows of stitches, and replaced in the abdominal cavity. The abdominal wound was sutured and dressed with iodoform. Very little reaction, no vomiting. Discharged on the twenty-first day in good health.³¹

1886. "Dr. Bernays, of St. Louis, last week successfully performed a gastrotomy upon a tailor, aged forty, for the extraction of an ordinary silver-plated dinner knife nine and a half inches long, which he had swallowed in imitation of the juggler's feat."³⁴

Polaillon, of Paris, is said to have removed a foreign body from the stomach this year with recovery.

Following the classification of cases adopted by Credé we have the following tables of gastrotomies:

(a) For foreign body in œsophagus.

No.	Operator.	Nature of Body.	Length of Cut.	Result.
1	Richardson, 1886.	Set of teeth.	6 inches.	Recovery.

(b) For foreign body in stomach.

No.	Operator.	Nature of Body.	Length of Cut.	Result.
1	Schwab, 1635.	Knife.	Small.	Recovery.
2	Tilan's, 1848.	Silver fork.	2 cm.	Death.
3	J. Bell, 1856.	Bar of lead.	Small.	Recovery.
4	Labbe, 1875-6.	Fork.	Small.	"
5	Billé, 1880.	Silver wire.	2½ cm.	Death.
6	Kocher, 1883.	Coin probang.	3 cm.	Recovery.
7	Gussenbauer, 1883.	Sword blade.	Small.	Death.
8	Schönborn, 1882.	Ball of hair.	Quite large?	Recovery.
9	Thornton, 1883.	Ball of hair.	"	"
10	Billroth, 1885.	Set of teeth.	Small.	"
11	Credé, 1885.	Set of teeth.	5 cm.	"

CASES WHERE THE STOMACH WALLS ARE UNINJURED AND NON-ADHERENT.

No.	Operator.	Nature of Body.	Length of Cut.	Result.
1	Schwab, 1635.	Knife.	Small.	Recovery.
2	Tilan's, 1848.	Silver fork.	2 cm.	Death.
3	J. Bell, 1856.	Bar of lead.	Small.	Recovery.
4	Labbe, 1875-6.	Fork.	Small.	"
5	Billé, 1880.	Silver wire.	2½ cm.	Death.
6	Kocher, 1883.	Coin probang.	3 cm.	Recovery.
7	Gussenbauer, 1883.	Sword blade.	Small.	Death.
8	Schönborn, 1882.	Ball of hair.	Quite large?	Recovery.
9	Thornton, 1883.	Ball of hair.	"	"
10	Billroth, 1885.	Set of teeth.	Small.	"
11	Credé, 1885.	Set of teeth.	5 cm.	"

³¹ Credé. Loc. cit. Langenbeck's Archiv., Vol. 29, page 609.

³² Lancet, 1886, No. 3.

³³ Credé. Loc. cit, page 586.

³⁴ From Med. News of Phila., November 27, page 600.

II

CASES WHERE THE STOMACH WALL IS INJURED AND ADHERENT.

No.	Operation.	Nature of Body.	Result.
1	Florian Mathis, 1602.	Knife.	Recovery.
2	Wesener, 1692.	Knife.	"
3	Hübner, 1720.	Knife.	"
4	Frizac, 1786.	Knife.	"
5	Cayroche, 1819.	Silver fork.	"
6	Bertherand, 1823.	Silver spoon.	"
7	Fideli, 1836.	Brass fork.	"
8	Hohlbeck, 1858.	Iron fork.	Death.
9	McKee, 1879.	Copper wire.	Recovery.
10	Fleury, 1880.	Fork.	"
11	Gerard, 1882.	Wood.	"

III

INCOMPLETE OR NOT WELL AUTHENTICATED CASES.

No.	Operation.	Nature of Body.	Result.
1	Reynaud.	Fork.	Recovery.
2	Dr. L.	Silver spoon.	"
3	Garcia, 1830.	Stick of wood.	"
4	Glück, 1856.	Laryngeal probang.	Death.
5	—, 1856.	Fork.	Recovery.
6	Bouchet.	Silver fork.	Unknown.
7	Felizet, 1880.	Spoon.	Recovery.
8	Hashimoto, 1882.	Tooth brush.	"
9	Bernays, 1886.	Knife.	"
10	Polaillon, 1886.	Not yet reported fully. (?)	

From the above tables we see: (1) 12 authentic cases where the stomach, uninjured and non-adherent, has been opened. Of these 3 died. (2) 11 cases where the stomach was injured and adherent, with 10 recoveries and 1 death. (3) 10 the authenticity of which is doubtful, with 6 recoveries, 1 death, and 3 doubtful, or, as yet unreported. Total of 33 cases, with 26 recoveries, 4 deaths, and 3 uncertain. Credé collected 26 cases. Of these the same one is mentioned twice — as J. Bell's and W. Bell's. Of these 25 cases, 21 recovered and 4 died. This list includes all the cases he was able to find, both the authentic and the doubtful. One case recorded by him, that of "J. Meckel" (J. A. McKee, U. S. A.), was probably not a gastrotomy, as the foreign body presented itself at the abdominal wall to the right and below the umbilicus.³⁵ This leaves his cases as 20 recoveries and 4 deaths.

We may therefore assert that the operation is a very successful one. The numerous recorded deaths which have followed the impaction of foreign bodies in the œsophagus, whether attended by the most violent and painful manifestations of their presence, or even unaccompanied by any symptoms whatever, the constant danger of inflammation, ulceration, perforation of important structures, hæmorrhage and exhaustion, make it imperative that the surgeon should exhaust all the resources of his art to afford relief.

When all other means have failed, and the foreign body is found by measurement to be within reach by œsophagotomy, this should be done as soon as serious symptoms appear. If it is found that the body is within reach from below, that is, more than thirteen, possibly twelve inches from the incision, and if the patient is in danger, as shown by constitutional symptoms, or imperilled by starvation, the stomach should be opened immediately, and attempts made to dislodge. If the symptoms are not urgent, a reasonable time should be allowed for natural efforts to aid in expulsion, but the operation should be done early enough to prevent the secondary changes of ulceration and perforation. If it is demonstrated that the foreign body is beyond the reach of œsophagotomy, and yet too high to be easily reached by the fingers from below, suitable instruments should be introduced through the stomach, guided by the finger, if necessary, for cutting, crushing, grasping or pulling down. I am convinced that in most persons no part of the œsophagus is beyond the reach of the fingers. In some cases there may be a very narrow interval which cannot be reached from one end or the other of the tube, but the surgeon's finger can be brought so near even in these cases that it may fairly be stated there is no part of the œsophageal canal in which a foreign body may become lodged, which cannot be reached with the finger, or, at least, to which an instrument cannot be guided safely and intelligently.

³⁵ See similar case by Dr. Sam White of Hudson, who removed spoon from intestines in 1806. Med. Reporter, 1807. 2 Hexade, iv, 367-373.