A contribution to the surgery of foreign bodies / by W.S. Halsted.

A CONTRIBUTION TO THE SURGERY OF FOREIGN BODIES

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BY

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A CONTRIBUTION TO THE SURGERY OF FOREIGN BODIES.

I. STELLATE CALCULI IN FORM RESEMBLING JACKSTONES REMOVED FROM THE BLADDER BY SUPRAPUBIC LITHOTOMY.

II. TWO HUNDRED AND EIGHT FOREIGN BODIES AND SEVENTY-FOUR GRAMMES OF GLASS EXTRACTED FROM THE STOMACH BY GASTROTOMY. RECOVERY.

BY W. S. HALSTED, M. D.,

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I. Large stellate, "jackstone calculi" removed from the bladder by suprapubic cystotomy.

B. G., æt. 84, was admitted to the Johns Hopkins Hospital December 9, 1891. The patient was too feeble to give a clear history of his case. He believed that until about a year ago he had had no bladder symptoms. At this time, he had, as he called it, a severe attack lasting about one month, characterized by painful and difficult micturition. Patient regained his health, he stated, and could get about quite as well as before, except that he could not ride horseback; the jolting of riding produced pain in his perineum and a desire to urinate. He remained well until the present attack, which began about six weeks before admission and was almost precisely like the first one. He now micturates two or three times an hour or oftener, passing from 10 cc. to 50 cc. at a time.

Examination.—Patient is emaciated; his mucous membranes are pale; his arteries tortuous and rigid; he has a conspicuous arcus senilis; his bladder is distended to within 4 cm. of the umbilicus; the meatus urinarius is very small; the prostate is very large.

Urine.—Specific gravity 1010; albumin; reaction alkaline; much sediment. *In sediment:* epithelial cells, a few red corpuscles, amorphous urates and numerous triple phosphate crystals. It was considered inadvisable to explore the bladder with an instru-

ment before operation because of the patient's very feeble condition.

Operation December 11, 1891. Suprapubic cystotomy.—An incision into the bladder large enough to admit two fingers was made, and five calculi were extracted with the fingers (see Fig. 1). These calculi were lying free in the pouch behind the prostate. They were very light in weight and light grayish-brown in color. The largest calculus, the one first extracted, resembled so strikingly the ordinary jackstone that the five stones have always been referred to as *jackstone calculi.* The perfect one has six prongs of about equal length, joining a small hub at the centre; these prongs are so inserted into the hub that each one is at right angles to all of the others, except the one which is in a direct line with it. Each prong is bifid at its tip. The smaller stones are less perfect, but they appear to be all of the same type.

Last summer I was greatly pleased to discover in the Hunterian Museum of the Royal College of Surgeons, London, two sets of minute calculi resembling closely those which I have just described. There are twelve in one set, and fifteen in the other. All of the stones in the Museum of the Royal College are much smaller than mine and were obtained post mortem from the kidney. My largest stone measures 3½ cm. in its longest diameter and is almost perfectly symmetrical. Oliver T. Duke, Esq., presented, in 1868, the set of fifteen to the Museum of the Royal College of Surgery. This set is labeled *C 78* in the museum catalogue. The second set, presented by J. McCarthy, Esq,, is labelled *C. 144* in the catalogue of the museum, and before presentation was described by him in the Medico-Chirurgical Transactions, published by the Royal Medical and Chirurgical Society of London, Vol. LV, 1872, p. 263. Mr. McCarthy furnishes a plate of the stones and the result of the analysis of one of them. Unfortunately our *jackstone calculi* were so carefully laid away by some one before a chemical analysis had been made that we cannot find them. Inasmuch as the Medico-Chirurgical Transactions are accessible to so few of us, and Mr. McCarthy's brief description of his calculi is so admirable and interesting, I shall quote what he says:

"In February, 1872, a woman was admitted into the London Hospital under the care of Mr. Couper for spontaneous fracture of the neck of the left femur, the result of cancer, which, originating in the uterus, had spread through the sarcosciatic foramina and

FIG. 1.—Vesical Calculi removed Dec. 11, 1891, by suprapubic cystotomy (exact size).

involved the soft structures round the left hip with the upper part of the left femur. She was moribund when admitted and there was nothing to attract attention especially to her kidneys, any pain that she complained of being naturally referred to the disease of the uterus.

"She died soon after her admission, and on making the post-mortem examination I found the upper part of the pelvis filled with a cancerous mass which pressed upon, and obliterated her left ureter; on removing the left kidney and making a section in the usual manner, I found the pelvis enormously distended, the medullary portion almost altogether absorbed, and the cortical substance the seat of acute suppurative nephritis. The upper part of the left ureter was occupied by a large conical mulberry calculus and the distended pelvis contained eleven calculi; the remarkable shape of which induces me to bring them under the notice of your society.

"The calculi all felt soft and greasy when first removed from the kidney and some greatly resembled biliary calculi. The projections on the surface of the large calculus were unusually acuminated, and the rest consisted of a central globular body with four or five prominent spines. In five the central mass was about the size of a black currant, and the spines were short and stunted. In the remaining six the central part was smaller and the spines longer and more tapering. Three had a very symmetrical tripod base with a single erect central spine. The other three had much the same general outline but with one or more additional and shorter spines. The pelvis of the right kidney contained a single oblong spiculated calculus which has been analyzed for me by Dr. Tidy, assistant to the Lecturer on Chemistry at the London Hospital Medical College. The results of his analysis are as follows:

Moisture	9.55 per cent.
Oxalates	8.72 "
Lithates	34.8 "
Chlorine	3.22 "
Sulphuric acid	4.56 "
Phosphates	a trace.
Fat and Cholesterine	36.56 per cent.
Loss	2.59 "
	100.00

"Mr. Curling has kindly informed me that there is a somewhat similar specimen of renal calculi in the museum of the Royal College of Surgeons. They are much smaller, with very fine and delicate spines. They are numbered *C 78* in the catalogue and are described as being composed of oxalate of lime. They were found in the kidney of a patient in whom the only noticeable feature during life was albuminuria. I cannot offer any explanation of the unusual shape of these calculi, which appear to be too symmetrical to have been formed accidentally."

I, too, am at a loss for an explanation of the form of these calculi, and, with Mr. McCarthy, agree that something more than accident is responsible for their symmetry. I did not extract them from pockets in the bladder wall. We were not permitted to make an autopsy upon our patient, who became delirious almost immediately after the operation, had suppression of urine, and died on the seventh day.

In the Hunterian Museum these calculi are labeled and known as the oxalate of lime calculi. It is greatly to be regretted that an examination of our calculi could not have been made; but I still believe that some day they will be found.

II. Two hundred and eight foreign bodies and 74 grammes of glass extracted from the stomach by gastrotomy. Recovery.

A. S., æt. 21, carpenter, was admitted to the Medical Side of the Johns Hopkins Hospital on Wednesday March 14, 1900. The patient had been making his living by swallowing, or pretending to swallow, glass, tacks, etc. His present illness dates from Saturday, March 10, when he was stripped by some medical students and challenged to swallow articles in their presence to convince them that he was an honorable man and not a fake. He began his demonstration at 7 P. M. Saturday and did not satisfy his diabolical inquisitors until 2 o'clock Sunday morning. About 2.45 A. M. on Sunday he vomited dark fluid, but none of the ingested foreign bodies. After vomiting, he experienced a sharp, piercing pain in the epigastric region and back. He has attempted to take his food regularly, although vomiting followed each meal. The distress has been constant, and exacerbations of pain are often severe. Patient could not sleep on the following Sunday night,

and on attempting to start to work on Monday morning, he suddenly vomited. Altogether he vomited twice on Monday, twice on Tuesday, and once on Wednesday morning; the last vomitus was very green. At no time have there been foreign bodies in the vomitus. Loose greenish stools on Sunday, Monday and Tuesday contained none of the ingested bodies.

March 14. Patient had a chill yesterday morning followed by fever. He complains to-day of very severe pain in the abdomen, particularly in the epigastrium. At times he rolls himself about in bed in paroxysms of pain. The abdomen is quite flat but very rigid. The respiratory movements are greatly restricted. All of the abdominal muscles are very rigid, but nothing further is made out on palpation.

In the skiagraph taken just before the operation, the stomach is sharply defined, as if the viscus was filled with a shadow-casting mass; but gentle palpation, even under ether, did not reveal the outlines of this mass. The reason for this undoubtedly was that the foreign bodies occupying chiefly the deepest part of the fundus of the stomach anchored it in such a position that it could not readily be palpated, and at least could not be distinguished clearly from the vertebral column and the ribs.

March 15, at 10 A. M., I saw the patient for the first time. The operation, begun at 10.30 A. M., was not completed until 1.45 P. M., although we worked as rapidly as possible. Under ether, an incision was made through the left rectus muscle; the entire hand of the operator was introduced into the abdomen and the stomach palpated; it was so heavily weighted with the mass of iron that it could not be drawn up into the wound, and I was afraid to prop it up from behind, lest its posterior wall should be perforated, or at least injured, by some of the sharp foreign bodies; so drawing gently on the anterior wall of the stomach, I succeeded in bringing a small portion of it to the surface. The stomach wall was thick and œdematous. An incision into the cavity of the stomach, large enough to admit two fingers, was made, after the abdominal contents had been very carefully walled off with large quantities of gauze. The first thing extracted was a steel chain resembling a small dog-chain; with it came numerous small pieces of glass and some blackish mucus stained with blood and iron and smelling strongly of iron. For fear that, during our

manipulations, which evidently would require a long time, we should let fall into the abdominal cavity some of the minute fragments of glass, I sewed a strip of fine linen to the circumference of the wound in the stomach, thus making a funnel, in which to catch even the finest spiculæ. It required nearly 2½ hours to evacuate all the bodies which could be felt. Several times I believed that the last piece had been removed, when the peristalsis of the stomach would bring something more within reach. I was much aided by the stomach peristalsis, for our longest forceps could not reach the most dependent point of the stomach. Finally I decided to sew up the stomach, because it seemed impossible to reach anything more from this opening, which was about 6 cm. from the greater curvature, and perhaps 10 or 12 cm. from the pylorus. I did not introduce my hand into the abdominal cavity to explore bimanually for additional foreign bodies, fearing to infect the peritoneal cavity; so after sewing up the stomach wound completely, we all disinfected our hands thoroughly and made a fresh toilet of the abdominal cavity; then on palpating the stomach which could now be drawn easily into the wound since almost all of the foreign bodies had been removed, it was evident that a knife-blade and several smaller foreign bodies were still present in the stomach. A second incision was then made in the stomach much nearer the cardiac orifice than the first, and just over the pouch in which the remaining foreign bodies were lodged, and from this second incision, which was only large enough to admit one finger, these bodies were removed in a few minutes. This stomach wound was then tightly closed, as was the first, with a double row of mattress sutures. The mucous membrane of the stomach seemed to be considerably injured by the foreign bodies, and great care was exercised in the extraction of these bodies lest further laceration of the stomach wall should occur. Many of the bodies during the operation were removed with large scoops, but most of them with forceps. Blood came away with each scoopful of glass and tacks, and it seemed to me that perhaps more damage resulted from the employment of the scoop than of the forceps. On examining the walls of the stomach after the operation was over, two minute, subperitoneal extravasations, pin-head in size, were discovered on the posterior surface of the fundus of the stomach. The abdominal wound was closed with silver wire; mattress sutures for muscle

and fascia, and a continuous buried suture for the skin. The patient was infused with salt solution immediately after the operation.

March 16. Pulse ranged from 100 to 160; temperature from 100.5 to 104.9. Intense thirst; mind perfectly clear; great tenderness on palpation. Abdomen not distended. Patient is flushed and slightly cyanotic.

March 18. Patient is still flushed, with a distinct suggestion of cyanosis; but neither pulse nor temperature evidence infection.

March 20. General condition good. Abdomen not distended. Patient still flushed. Yesterday patient passed a large quantity of coffee-ground material. He appears to be perfectly comfortable.

March 21. Patient has some cough and complains of pain in wound on coughing. Binder removed and dressings replaced. Wound reported as dry and looking well. Abdomen not sensitive to pressure.

March 22. Patient obtained, surreptitiously, some bread, coffee and water from other patients. Comfortable all day, but about 9 P. M. began to complain of abdominal pain. Wound reported healed per primam. Abdomen slightly distended.

March 23. Patient's cough continues. He complains of pain in the wound on coughing. Condition good. Patient has no abdominal symptoms. The wound, which had apparently healed per primam, has broken down throughout its whole length and depth. The recti muscles, so far as exposed during the operation, are covered with a necrotic film. In places there is considerable sloughing of the tissues. Patient's cyanotic flush has disappeared.

March 24. About 12.30 patient began to complain of pain in the wound. On investigation the wound was found to be widely open; out of its lower angle there protruded a knuckle of bowel. The bowel was immediately replaced and retained by gauze packing. Patient's general condition excellent. No elevation of temperature and no signs of general peritonitis.

April 4. Patient is receiving soft diet—eggs, milk, toast, etc. All packing has been removed from the wound. In the lower angle of the wound is still to be seen a small knuckle of gut covered with granulations and adherent to the parietal peritoneum.

April 15. Patient is well. He has a good appetite and is permitted to eat what he fancies. The wound is reduced to a narrow

granulating sore. His abdomen is no longer sensitive to pressure. No foreign bodies have been passed per anum since the operation.

Articles swallowed:

20	pieces of small dog-chain	460 cm.
1	piece of large dog-chain	29 "
4	watch chains	31 "
1	brass chain	59 "
2	pieces of chain	15 "
28		594 cm.

10	horse-shoe nails.
54	wire nails (16 of these 7½ cm. long).
35	ordinary nails (8 of these 6 cm. long).
99	

8	screws (2½-3 cm.).
2	screw eyes.
7	knife blades.
1	knife handle.
50	tacks.
12	pins.
1	piece of tin.
81	

208 articles and 74 grms. of broken glass. See Plates I, II and III.

In a recent article by Hecht in the Wien. med. Woch.,[1] we read: "As I find from consulting the literature, gastrotomy, even in the præantiseptic and præaseptic times, was an operation comparatively free from danger." I have found only four authentic cases of gastrotomy for foreign bodies in præantiseptic times in which the stomach was not, at the time of the operation, adherent to the parietal peritoneum. One of these cases died on the third day after the operation; in two the wound of the stomach was very small and not even stitched, and in the fourth case "the threatened peritoneal symptoms were conquered by collodionated cuirass, compression and champagne frappé."[2] One could not, fortified only with the knowledge of these cases, proceed, with great confidence to do a gastrotomy for the removal of foreign bodies.

[1] Wien. med. Woch., 1898, Bd. XI, No. 46, S. 1045.
[2] Poulet, Foreign Bodies in Surgery, Wm. Wood & Co., N. Y., 1880.

In 1880 Poulet[1] wrote: "The operation of gastrotomy is hardly accepted by all surgeons, and the small number of cases which the literature contains testify to the scant sympathy it has met with for centuries, and to the rarity of its indications. Gastrotomy is, nevertheless, a very old measure, since it is found in the writings of authors who lived before the reign of Louis XIV. One of these cases quoted by Hévin bears the date of 1636; that of Crollius occurred in 1602; but since that period, despite the thousands of cases of foreign bodies which have been accumulated, there are not more than 20 cases of gastrotomy."

Credé[2] in 1886 collected 26 cases, but in nine of these the stomach was at the time of operation adherent to the abdominal wall, and in seven it is not stated in the unsatisfactory reports of the operators whether the stomach was adherent to the wall of the abdomen or not; in two of the seven badly reported cases, even the result is not given. Until 1886, therefore, we find collected only ten cases in which the stomach was not adherent to the parietal peritoneum when it was opened for the removal of a foreign body. Two of the ten died. Only one foreign body was removed from each stomach in the remaining eight cases; in all, 1 table knife, 1 leaden bar, 1 fork, 1 broken coin-catcher, 2 hair balls, and 2 sets of false teeth. Foreign bodies are swallowed most often by the insane and by jugglers, yet among the eight cases prior to 1886 which recovered from gastrotomy, there was, I observe, not an insane person nor a juggler; but of the two gastrotomized patients who died from the operation, one was insane and the other a professional sword-swallower.

The insane patient,[3] a woman, aged 32 years, had swallowed a silver spoon 21 cm. long; the juggler,[4] a youth aged 19 years, a piece of sword blade 27 cm. long and 2 cm. broad. Both of these cases were evidently in very bad condition when operated upon.

Insane people swallow foreign bodies usually with suicidal intent; and only when their suffering is more than they can bear do they confess what they have done. Even then they are often disbelieved, and so the operation is postponed and the chances for

[1] Loc. cit.
[2] Credé, Arch. f. klin. Chirurgie, Bd. XXXIII, Heft 3, S. 574.
[3] Case of Tilanus in Leyden, 1848.
[4] Case of Gussenbauer in Prag, 1883.

recovery lessened. Jugglers, too, have contributed more than their proportion to the mortality roll. This is partly due to the fact that the very large objects (*i. e.*, pieces of sword blade) and objects in large quantities have been ingested principally by men of this class. They, too, are disposed to conceal their suffering, and continue their performances, giving five or six daily, when they know that their distress is caused by the bodies which they have swallowed.

As I have said, Credé in 1886 furnished us with a very carefully prepared table of the cases to date; and the same year, in Maurice Richardson's most admirable contribution,[1] we find several additional cases collected. Then Fricker,[2] in 1887, tabulates 27 cases operated upon since Credé's publication, and contributing a very remarkable case of his own, brings the total number of gastrotomies for foreign bodies in the stomach and œsophagus up to 54. Fricker's table is a full one, giving the principal facts in each case. A year later, Meisenbach,[3] on the lines laid down by Fricker, gives all the cases to date; adding five cases, including a creditable one of his own, he makes a total of 59. In November, 1898, Hecht[4] contributes a case of his own and two others, and appends the bibliography of the subject. In the 62 cases there were only 11 deaths, 17.7 per cent. Hecht attributes to peritonitis only two of these. It is my opinion that peritonitis was at least present in four of the fatal cases, and would surely have supervened in one of the two cases which died of shock, and probably in the other.

In most instances only one foreign body has been present, but in six cases many articles were extracted from the stomach. Three of the six cases died, two of shock within four hours, and one within forty-eight hours. Eleven pounds and nine ounces was the total weight of the articles removed from one of the fatal cases. Of the three that lived, Mayo Robson's[5] furnished the greatest number of foreign bodies, viz., 42 cast-iron garden nails $1\frac{5}{8}$ inches long; 93 brass and tin tacks from $\frac{1}{2}$ to 1 inch long; 12 large nails, some brass-

[1] Richardson, Boston Med. & Surg. Jour., 1886, Vol. II, p. 569.
[2] Fricker, Deutsche med. Wochenschr., January, 1897, S. 56.
[3] Meisenbach, Journal Am. Med. Assoc., March, 1898, p. 513.
[4] Hecht, Wiener klin. Wochenschr., Nov., 1898, S. 1045.
[5] Mayo Robson, Lancet, 1894, p. 1028.

headed; 3 collar studs, one safety-pin, and one sewing needle. During the 22 days following the operation there passed, per anum, embedded in hard fecal matter, thirty garden nails, a piece of needle, one stud, eight tacks and a pen. This patient of Mr. Robson's was only ten years old, said to be an intelligent girl who apparently could not control her morbid appetite, for after her recovery she continued to swallow articles which she could not digest.

The second case was also a remarkable one. A woman, during a temporary attack of insanity, swallowed the articles which Fricker[1] subsequently removed:—1 key, 2 teaspoons, 1 fork, 2 pieces of wire, 2 hair-pins, 12 pieces of glass, I window-latch, 1 steel pen, 9 sewing needles, I piece of graphite, 1 shoe button, 1 crochet needle, and *one grape seed.* Quite a large abscess had formed, and through it the crochet needle was withdrawn; but the other bodies were removed through an incision which Fricker carried through the posterior wall of the abscess into the stomach and also into the general peritoneal cavity; fortunately general peritonitis did not result.

Meisenbach's[2] is the third successful case of the kind. He extracted 25 staples for barbed fence wire; 15 one and one-half inch screws; 6 two inch horseshoe nails; 16 two inch wire nails; 30 one and one-half inch wire nails; 16 thirty-two calibre cartridges; 5 thirty-eight calibre cartridges; 2 pocket-knife blades (broken); 2 inches of brass washstand chain, and 2 small staples; total 119 pieces. Eight cartridges passed after operation. There was also one ounce of comminuted glass (electric light globe), making the total number of objects 127, total weight, one pound.

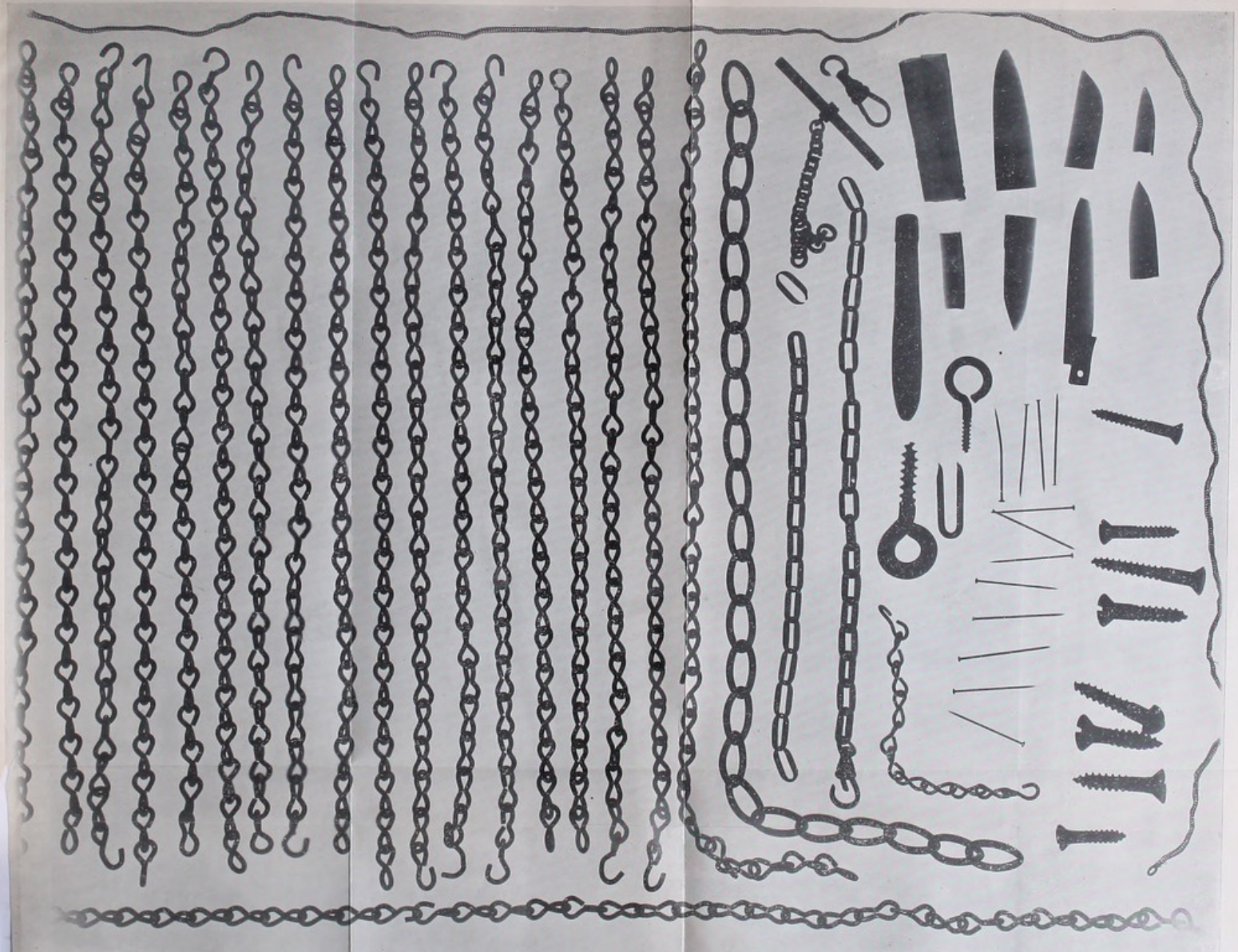
That peritonitis was avoided in my case, notwithstanding the facts that the stomach could not for a long time be drawn out of the abdominal cavity, and that the operation lasted so many hours, is probably in part due to: 1. The small openings into the stomach which could be quite perfectly controlled. 2. The employment of the strip of linen which was sewed just outside of the edges of the incision into the stomach wall to prevent the escape into the abdomen of small particles of glass. This is not a theo-

[1] Fricker, Deutsch. med. Woch., January 21, 1897.
[2] Meisenbach, loc. cit.

retical danger; for quite large bodies have been found free in the abdominal cavity which could only have escaped through the gastrotomy wound. 3. The great care exercised and the large amount of gauze used to prevent soiling of the abdominal contents. 4. Postponing a second bimanual examination of the stomach until the first incision into the stomach had been sutured, until a fresh toilet of the abdomen had been made, and until the hands of the operator and assistants had been disinfected. 5. The very thorough suture of the stomach wounds.

Suture of the stomach.—The stomach wound should be most carefully sutured, and unless some contraindication exists the stomach should be dropped back into its normal position. With a running stitch through the mucosa, close off the stomach cavity so that the parts no longer soiled by stomach contents may be carefully cleansed before the next row of sutures is taken. Catgut may be used for this suture of the mucosa; next a row of mattress sutures of fine silk; each stitch of this row should enter the submucosa but not the mucosa. A third row of stitches is important as a safeguard against a possible perforation of the mucosa by one of the stitches of the second row. I have, within a year, produced a fatal peritonitis by a single stitch which entered the lumen of the stomach. The stitches of the third row should include only the muscular coats of the intestine. It is, as I have frequently pointed out, incorrect to speak of a suture of the peritoneal coat, for even if the peritoneum were not destroyed by the manipulation, it is too thin to play any part whatever in the suture of the intestinal wall; and twice, recently, I have observed that the wall of the intestine, although deprived of its peritoneum, can dispose of micro-organisms virulent enough to produce an acute toxæmia and extensive superficial necrosis of the muscles and fat of the abdominal wound. In the case which we are considering, it is possible that the gastric juice lowered the resistance of the tissues which succumbed so rapidly to the infection of the abdominal wound.

Skiagraph of the abdomen before operation. The outlines of the stomach and pylorus are distinct.

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