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With Original Report of Twenty Successful Cholecystenterostomies by Means of the Anastomosis Button.

BY

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Read before the Section on Surgery and Anatomy at the Forty-fourth Annual Meeting of the American Medical Association.

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Of the many absorbing topics of medical literature, of the many changes in the art of surgical treatment made in the last two decades, of the many glorious achievements attained in this period under aseptic and antiseptic methods, of the many of these in which the results are still imperfect and offer great reward for honest experimental and clinical research, one of the youngest and yet a very interesting and inviting one is the surgery of the gall tracts. All of its achievements are the fruit of very little over a decade of labor, and probably we have only just begun to make progress in this direction; great possibilities are before us. In drawing your attention to this subject to-day, it is not my desire so much to enumerate the steps already accomplished, as it is to ask your assistance for its further advancement. The scope of this paper includes only the operative element of the surgery of the gall tracts; I will therefore not go into details as to the lesions which produce the necessity for the operation, but will only refer to them cursorily, as indications for the special operations to be performed. We will First devote a few minutes to the surgical anatomy of the region

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in which they are situated, as well as to the tracts themselves. Second, we will consider the functions or physiology of the gall bladder and gall tracts; for good surgery is based on good physiological principles, and good operations must be executed on good anatomical lines. Third, we will take up the individual operations, and the special indications for each.

THE GALL BLADDER.

The fundus of this organ lies opposite the ninth costal cartilage, close to the outer edge of the rectus, the body itself is situated in a fossa on the under surface of the right lobe of the liver, having the quadrate lobe to its left. It is in immediate contact with the hepatic flexure of the colon, and the first portion of the duodenum. The gall bladder is of pyriform outline, and when full is seen projecting beyond the anterior border of the liver, coming in contact with the abdominal wall at the cartilage of the ninth rib. It extends almost directly backward, deviating only a little to the right and upward; it measures from two and one-half to four inches in length, and one and one-half inches in diameter at the widest part, and holds about one fluidounce. It is always found full, except where some external pressure is brought to bear upon it. It is attached to the liver by connective tissue, the lower surface is covered by peritoneum, though occasionally it entirely surrounds the viscus and forms a sort of mesentery to attach it to the liver. The neck of the gall bladder gradually contracts until it forms the cystic duct. This duct is a tube an inch to an inch and a half long, which connects the neck of the gall bladder with the hepatic duct, and combines to form the common duct, or the ductus communis choledochus. The cystic duct is directed backward and to the left as it runs in the lesser omentum; the hepatic artery being to the left and the portal vein behind. The hepatic artery passes behind the hepatic duct and between it and the portal vein. This is a very important point to remember, as it assists the operator in differentiating between the duct and the vein in operations. The duct and the vein having the same color, and being situated in close proximity, it is very important to recogize the duct in this situation above the artery, and the vein below it. The hepatic duct is formed by a branch from each lobe of the liver in the transverse fissure, and is directed downward and to the right in the lesser omentum, the hepatic artery being to the left at its first part, and then behind. It is not quite two inches long and joins with the cystic duct to form the common duct. The common bile duct

is about three inches in length, it passes down between the layers of the lesser omentum, immediately in front of the portal vein, and to the right of the hepatic artery; it then passes behind the first part of the duodenum, then between the second part and the head of the pancreas and ends at the lower part of the second segment of the deodenum by opening into that part of the intestine on its left side and somewhat behind. It pierces the intestinal wall very obliquely, running between the muscular layers for about three-quarters of an inch. The pancreatic duct enters the common duct just before its termination. Immediately below where the pancreatic duct opens into the common duct, there is a dilatation of the common tube, called the ampulla of Vater. There is a slight constriction at the terminus of the duct, the papilla. This papilla in the duodenum is about four inches from the pylorus. The common duct has a diameter of two lines, its width at the ampulla is three lines, it is narrowest at its outlet into the duodenum. The cystic and hepatic ducts are a little narrower than the common duct. The diameter of the ducts is a matter of considerable practical importance; that of the cysticus and choledochus being so near alike, that a concrement that will produce obstruction in the former will do the same in the latter, though of a lesser degree until it reaches the ampulla, where there is considerable more space. Stones are frequently retained in the ampulla, as the orifice of the duct in the intestine is much smaller than any portion of the tract. Calculi retained in this position buried behind the duodenum produce very grave symptoms, as jaundice, and a septic fever of a typical intermittent character.[1]

Obstruction at this point, on account of its location, is so very difficult to reach and remove that the surgeon, in place of attacking the obstacle producing the obstruction, selects a method of circumventing it and allows the bile to enter the duodeum through another tract, viz., by cholecystenterostomy. It will be seen that the distance from the fundus of the gall bladder to the opening of the duct in the duodenum is made up of the combined lengths of the gall bladder, ductus cysticus and choledochus, measuring in all from six and a half to eight and a half inches. This should be remembered in sounding the ducts for obstructions with a bougie or probe. The gall bladder consists of three coats, the serous, the fibrous and muscular, and mucous. The serous coat covers only about two-fifths of the surface, that on its under side. The mu-

[1] See Dr. W. E. Quine's excellent monograph on this subject.

cous is raised in rugae, bounding polygonal spaces, which are largest about the body. These rugae play an important part in the formation of hepatic calculi. The mucous membrane is lined with columnar epithelium, and contains many mucous glands. At the neck the mucous membrane forms folds projecting into the interior acting as valves, Heister's. This layer contains an anastomosis of blood vessels and a fine plexus of lymphatics; the presence of these lymphatics accounts for the formation of secondary abscesses and septic manifestations from infective lesions of the gall bladder. The fibrous and muscular coat consists more of fibrous than muscular tissue and has but very little power of contraction, since I found in the healthy gall bladder of the dog, by ligating the ductus cysticus, that only a small quantity of bile, average thirty drops, was forced out by the automatic contraction of the gall bladder through a canula placed in its wall; this quantity representing only about six per cent of the contents of the gall bladder.

PHYSIOLOGY.

This leads us to a consideration of the physiology of the gall bladder. The gall bladder is credited by physiologists with being the store house for the bile. Landois states that "the gall is secreted continually, but part is stored in the gall bladder, and poured out copiously during digestion." This expresses the accepted theory of the functions of the gall bladder. I desire to question the correctness of this theory, and in order to place the issue more clearly before you, I make the assertions, bold as they may seem, first, that the gall bladder is not for the purpose of storing the bile and delivering it into the intestines on demand; second, that the gall bladder is the controller or governor of the tension of the bile circulation. When we consider that the amount of bile secreted daily is forty ounces, Murchison; 566 grams, Westphalen; or 652 cubic centimeters, John Ranke; or about 105 minims to each pound of body weight, we can readily see what little difference it would make in the quantity and current of bile entering the intestines at the time of digestion, even if the gall bladder should contract and empty its whole contents, one ounce, into the intestine during the period of two hours of time, *i. e*, the two hours between three and five hours after the ingestion of a meal. For instance, the bile flows most rapidly at two periods viz., between three and five hours and between eleven and thirteen hours after the ingestion of food; in those two periods about ten ounces of bile is discharged. If the quantity of bile forced out of the gall blad-

der by its inherent contraction, one-half drachm, be added or taken from these ten ounces, would it make any perceptible difference in the current? It can be readily seen that it would make no appreciable difference in the whole quantity discharged, *i. e.*, ten ounces. We are then forced to the conclusion that the liver secretes at these periods this large quantity and that it is not "poured out" by the gall bladder as stated by Landois. Again, if the function of the gall bladder were to contract and expel its contents during the act of digestion, would we not frequently find an empty and physiologically contracted gall bladder either ante-mortem or post-mortem? I have yet to find one, notwithstanding I have observed them on the living and dead subjects, at all hours before and after eating and I have yet to see a surgeon who has found a physiologically empty gall bladder. That the gall bladder does not empty and fill with each digestive act is further supported by the fact that the bile in the healthy gall bladder is of much greater specific gravity than that in the hepatic, cystic and common ducts of the same subject. The bile in the cystic duct is like the bile in the hepatic and common ducts, and differs from that in the fundus of the gall bladder. If the bile in the gall bladder emptied and filled several times in each twenty-four hours, *i. e.*, after each meal, it should have the same specific gravity as the bile in the cystic duct, which is not the case. Further, the bile in the cystic duct, has the same specific gravity as that in the hepatic and common ducts which shows that only this small quantity changes with the contraction and dilatation of the gall bladder. This degree of contraction and expansion is very limited, depending on the degree of tension of the bile circulation. After ligation of the cystic duct at its junction with the gall bladder, and extirpation of the latter, it has been found that in a number of months the cystic duct becomes much dilated, resembling a miniature gall bladder, Oddi. I have verified this by one experiment.

Experiment III.—Dog, male, weight thirty-five pounds. May 14, 1892, cholecystectomy, silkworm gut ligature of adhesions to liver; subsequent section, silkworm gut ligature of ductus cysticus, top sewing peritoneum. The dog was sick for the first forty-eight hours, after that he rapidly improved and in four days he was apparently as well as ever. No jaundice. June 12, the dog has become very fat and is the most playful dog in the laboratory. August 31, dog killed. The cystic duct was found to be dilated to a globular sac, five-eighths of an inch in diameter.

After a gall bladder and intestinal fistula has been established,

gradual contraction occurs; the gall bladder contracts to a tube not much larger than the cystic duct, as the element of tension is here entirely removed. This change requires several weeks. I do not know that dilatation of the cystic duct after cholecystectomy has been observed in man; it is possible that it does not occur since in man there is no sphincter muscle at the opening of the common duct into the intestine, as in the dog. The tension theory of the gall bladder is further supported by the mechanical relations of the gall bladder and cystic duct to the hepatic and common ducts. It will be noticed that they occupy the same relative position to the current of bile passing along the hapatic and the common ducts that the air chamber in the fire engine does to the stream of water flowing from the pump to the hose. The elasticity of air in the small air chamber contributes greatly toward producing a continuous instead of a pulsating stream, as would occur with the strokes of the piston, were there no elastic chamber. In place of the air in the case of the gall bladder we have the elasticity of the walls of the viscus itself, which keeps up the continuous pressure by its expansion and contraction and thus acts as a tension controller of the bile circulation. The gall bladder is congenitally absent in a considerable number of animals and men, and its absence appears to have no appreciable effect on the health of the organism. I have gone into the details of this somewhat thoroughly because a clear understanding of the physiological principles is necessary in order that we may better judge the most desirable operations to be performed under given circumstances.

The various pathological conditions of the gall tracts which necessitate operative interference requiring laparotomy, to which line of operations this paper will be confined, I will only mention by name, and will not go into the details of each. In the order of frequency with which they produce disturbances they should be classified as follows:

1. Cholelithiasis, gall stones; a, in the gall bladder; b, in the ductus choledochus; c, in the ductus cysticus; d, in the ductus hepaticus; e, in the diverticula; f, ulcerative perforation into the peritoneal cavity.
2. Cholecystitis, empyema, hydrops.
3. Cancer of the pancreas.
4. Neoplasms involving the ducts.
5. Carcinoma of the gall bladder.
6. Traumatism.

OPERATIONS.

The operations on the gall tracts after the abdomen has been opened are well divided into ten classes, viz.:

1. Puncture of the gall bladder.
2. Incision into the gall bladder without further operative procedure.
3. Suture of the gall bladder to the abdominal wall with secondary incision, cholecystostomy, two sittings.
4. Suture of the gall bladder in the abdominal wall with immediate incision, cholecystostomy, one sitting.
5. Incision of the gall bladder, removing its contents, immediate suture of the gall bladder and suturing it in the wound of the abdomen, cholecystotomy.
6. Incision of the gall bladder with immediate suture and reposition in the abdomen, cholecystendysis, ideal cholecystotomy.
7. Cholecystenterostomy, gall bladder and intestinal fistula.
8. Cholecystectomy. Removal or amputation of the gall bladder.
9. Choledocholithotripsy or crushing of gall stones in choledochus.
10. Choledocholithectomy, with subsequent suture of duct.

INDIVIDUAL OPERATIONS.

I. *Puncture of the Gall Bladder.*—The puncture of nonadherent gall bladder after opening the abdomen has been performed but a very limited number of times (twenty-five), and through error in diagnosis in the greater number of cases. Eight times the operation was performed for its therapeutic effect, after the abdomen had been opened. Four of these eight were supposed to be circumscribed hydrops of the peritoneum; two of these cases terminated fatally. In the other four, the diagonis was clear and the object of treatment was to relieve the patient by aspirating the gall bladder. The cause of the dilatation was in three, cancer of the pancreas; in one it was due to calculus in the cystic duct. The final outcome in one case was unknown; one of the cases died of exhaustion after repeated puncture; in the other two cases cholecystotomy was performed, one of two died. We have here then a fatality of twenty-five per cent from simple puncture of the nonadherent gall bladder. In the other seventeen cases the puncture was purely explorative. Puncture of the gall bladder from the surface of the abdomen without incision was suggested by G. Harley for the pur-

pose of sounding for gall stones. He pronounced it an easy and safe method for sounding for impacted stones, but his patient died twenty-four hours after the operation of "enteritis and peritonitis." This operation is to be condemned first, because there is great doubt that a diagnosis can be made with a needle, even if a stone is present. Second, a needle puncture of the gall bladder is dangerous because the opening remains patulous, as I have frequently seen following aspiration preparatory to insertion of the button, from an absence or very limited contractile power of the tissues of the wall of the gall bladder and from tension by the bile pressure within. Third, if the contents of the gall bladder in the case should be septic, we would have as a result a septic peritonitis. Cour-

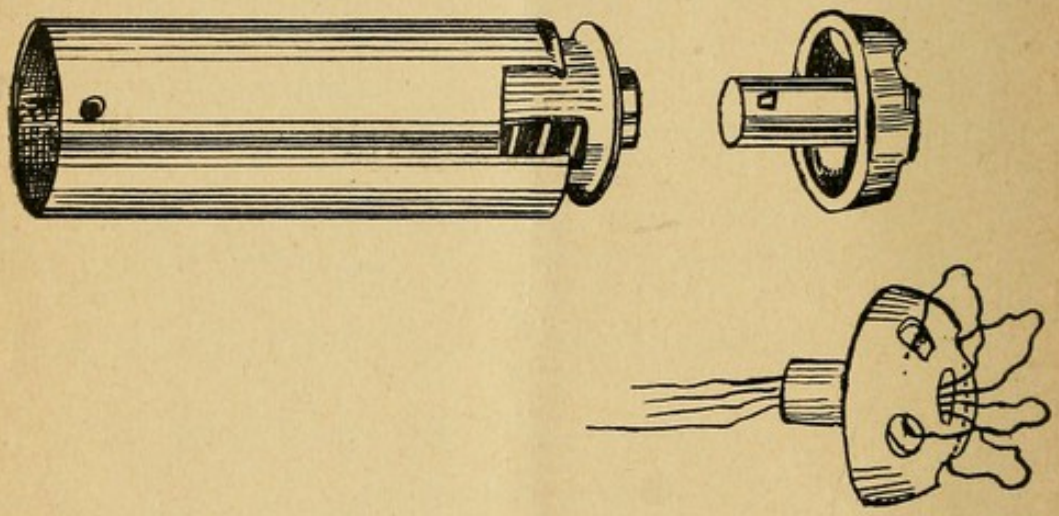


FIGURE 1.—Drainage tube button illustrating half of button threaded for introduction into gall bladder.

voisier says, "that a surgeon should even hesitate to aspirate a case where the diagnosis of gall bladder lesions was even suspicious, and never except where no other means of diagnosis is left, a laparotomy being a much more rational and safe method."

II. *Incision of the Gall Bladder Without Further Operative Procedure.*—This operation is performed for and should be limited to cases where the gall bladder, on account of the gangrene of its wall or extensive adhensions all around it render it impossible to either suture it to the abdominal wall or approximate it to any portion of the intestinal tract, and where it is compulsory to secure drainage of the bladder or to use the bladder as a canal to allow the escape of bile in obstructive jaundice, that jeopardizes the life of the patient. A drainage tube may be inserted in the incision of the gall bladder and packed around with gauze (Maurice H. Richardson), the omentum drawn about it with a few sutures to prevent the fluid passing into the peritoneal cavity, or what is still better,

my method of insertion of a "button tube drainage," of the pattern I here present, Fig. 1. This has the advantage; (1,) that it can be easily and rapidly inserted deep in the abdominal cavity, though the gall bladder may be very much contracted; (2,) that it prevents with certainty the contact of the gall bladder contents with the abdominal viscera until such time as adhesions have formed around the tube; and 3, that it leaves a large opening, when the instument is withdrawn from the gall bladder, through which calculi may be extracted. The operation with the "button tube" is performed as follows: An incision is made in the abdominal wall in the usual position for operations on the gall bladder beginning at the ninth costal cartilage, parallel to the external border of the rectus muscle for a distance of two and one-half inches. The gall bladder is located, a sufficient surface of its wall exposed, the contents aspirated, the purse-string suture inserted, the gall-bladder incised, male half of button inserted, purse string tied and cut short; the tubular portion of the button is then pressed into position; the tube is then drawn out as far as the gall bladder will permit and held there with a pin passed through the openings in the side. During the time the pressure atrophy in the portion of the gall bladder clasped between the button is taking place, a cicatricial wall is being formed about the tube which acts as the walls of a sinus after its production and insures continued protection to the peritoneal cavity.

The following operations were performed:

Case I. Mrs. K., æt. thirty-five, several children. This case was referred to me by Dr. J. H. Hoelscher who furnished the following history: Four years ago the patient was first attacked with severe pain in the region of the gall bladder, which was soon followed by nausea and vomiting. This pain lasted several hours and a few days after the onset the patient became very much jaundiced. Tenderness continued over the gall bladder for ten days or more after the attack. These attacks occurred at frequent intervals during the past four years; after some of the attacks she passed gall stones and has a collection of them on hand. About two years ago she had one very severe attack lasting much longer than the others and accompanied by more pain, fever and tenderness. It took her a long time to rally from this attack. The last attack, ten days before operation, was followed by jaundice and a few stones were passed. Not more than half of the attacks were followed by jaundice. She suffered very much most of the time from digestive disturbances and a constant aching in the side.

Present Condition.—Patient a well nourished, stout, healthy-

looking individual. On examination we find a large sensitive tumor extending down about three inches below the right ninth costal cartilage. This tumor can be felt separate and distinct from the kidney, and presses against the abdominal wall in front. It moves synchronously with the diaphragm in respiration.

Diagnosis.—Cholelithiasis with pericystitis. Operation by Dr. Murphy, assisted by Drs. Hoelscher and Lee. Present, Dr. MacFadden Gaston, of Atlanta; Dr. Quimby, of Jersey; Drs. Cole and Owings, of Montana; Dr. Jelks, of Hot Springs; Drs. Wittwer, Hartmann, E. H. Lee, Conley and Oswald. The usual incision was made at outer border of rectus. The gall bladder was completely surrounded by adhesions and contracted: it was impossible to approximate it to the abdominal wall or to any portion of the bowel. It was decided to put in the drainage button tube. A portion of the fundus of the gall bladder was exposed sufficiently large to insert the button and to place it in position. A number of calculi were removed and many allowed to remain. The tube projected above the wall of the abdomen, and the wound outside was packed with iodoform gauze. The button tube liberated itself on the seventh day, and a number of stones followed. The patient made an uninterrupted recovery, and is now in excellent health; has a small sinus, but no bile is escaping, August 20, 1893. September 15, sinus closed.

Case II. Mrs. M——, æt fifty, Indianola, Neb.

Diagnosis.—Cholelithiasis, impaction in choledochus. Had had repeated attacks of gall stone colic, accompanied by jaundice, in the last four years. For the last year the jaundice has been continuous.

Operation.—November 1, 1893. Found gall bladder very much contracted; filled with a dozen calculi. Firmly adherent throughout; evidence of old pericystitis. Duodenum adherent. As the approximation to duodeum could not be made, the gall bladder was incised, stones removed and the drainage tube button inserted and packed around with iodoform gauze. The button tube liberated itself on the tenth day. Two calculi followed it, which evidently had been returned from the ducts into the bladder. Jaundice disappeared. Sinus closed on twenty-first day. Patient about the ward on twenty-eighth day. Discharged from the hospital December 6.

The number of cases of operation by incision and drainage in literature is twenty-three, with four deaths, a mortality of about eighteen per cent. As this is not an operation of election, the pe-

culiarities of the individual case will be the guide to the surgeon as to when it must be performed.

III. *Suture of the Gall Bladder with Secondary Incision, Cholecystostomy in Two Sittings.*—The serous surface of the gall bladder is united to the margin of incision in the abdominal wall and a sufficient time is allowed to elapse for adhesions to take place, from five to fifteen days; then an incision is made in the gall bladder and its contents allowed to escape. The operation was first suggested by Carri, and executed by Blodgett and Kocher in 1878. Courvoisier collected thirty-two cases. Riedel operated in this manner thirty-four times, eleven of these are included in Courvoisier's report. I find in the literature from June, 1890, at which time Courvoisier's report was published, to February 28, 1893, but four cases, with the exception of those of Reidel, twenty-three cases, making a total of fifty-nine cases, with six deaths, or a mortality of ten per cent. Of the patients that left the hospital, about thirty-four per cent were discharged with a fistula; these had an average treatment of two and one-half months. Riedel has championed this operation from the beginning and has persistently adhered to it while other surgeons have taken up the operation of one sitting, as shown by the statistics, only four operations of this kind being reported since June, 1890. Bardenheuer, Langenbuch, Mikulicz and Lauenstein have been strong advocates of this operation in the order mentioned, but have all deserted it, notwithstanding its favorable statistics, leaving Riedel alone its great advocate. The indications for this operation are the same as for cholecystostomy of one sitting, to be mentioned hereafter.

IV. *Cholecystostomy in One Sitting, Suture with Immediate Incision.*—The first operation of this kind was performed on July 15, 1867, by Bobb, who was making a laparotomy on the diagnosis of ovarian tumor, this being the first laparotomy opening of the gall bladder and cholecystostomy of one sitting. Without a knowledge of this case, in the years 1878 and 1879, Marion Sims, W. W. Keen and Lawson Tait performed the same operation without previously diagnosticating the case. This operation was named by Lawson Tait "ideal cholecystostomy." It would be more appropriately termed unnatural cholecystostomy, as it is not natural for the gall bladder to empty on the surface of the abdomen. The term "natural cholecystostomy" should be reserved for the operation known as cholecystenterostomy, because the bowel is the natural receiver of the contents of the gall tracts. From that time there have been collected by Courvoisier 120 cases, by

Riedel 12 and by myself 69, making a total of 201 cases. The histories of many of these cases are very defective, first, as to the previous conditions; second, as to the status praesens and clinical history; third, as to the condition when discharged. Tait operated upon fifty-seven of these cases. In the very great majority he leaves out all the particulars above mentioned. In many he does not mention whether the fluid contents of the gall bladder was bile, hydrops, or pus, and in others he does not mention even the presence or absence of stone, though this item is less frequently omitted. I find in 163 cases stones reported in 112, and in about 75 per cent of these the stones were situated only in the gall bladder; in about 12 per cent in the gall bladder and cystic duct; 8 per cent in the cysticus alone; 3 per cent in the choledochus, and the balance scattering. In all cases where found, the stone was extracted from the gall bladder at time of operation. In other cases where stones were situated in the ducts, a lithotripsy was performed either by the fingers, by forceps, or by passing a needle through the wall of the duct and fracturing the stone. In other cases the stones were pressed onward out of the duct into the intestine or back into the gall bladder; in still others they were cut down on in the duct and removed through its wall. Of this I will speak later. The mortality in the 201 cases of cholecystostomy while the patients were still under treatment, was 39 or about 19 per cent. The number of cases discharged with fistula cannot be approximately determined as Tait's report is incomplete and excluded. From other statistics we have discharged with fistula about 31 per cent, and with the same exclusion as above complete recoveries 51 per cent. We see that the mortality in the one sitting was less than in the two sittings operation, in one case being 10, and the other 19 per cent, but still the outcome as to the ultimate complete recovery is approximately the same as in the operation of one sitting, and not a promising one for the patient. Still some surgeons have had brilliant results, and the renowned Dr. H. O. Marcy, of Boston, says: "It is safe to predict that the future history of operative measures for the relief of biliary obstructions, will furnish one of the most brilliant chapters in surgery. One of the most serious of all the abdominal diseases, as evinced by acute pain, prolonged suffering, and great mortality, confessedly without remedy by internal medication, cholecystostomy offers help to the hopeless with an attendant danger in the hands of an experienced surgeon of as small a percentage as in ovariotomy."

Cholecystostomy by Means of Murphy Button.—This operation can be performed with the anastomosis button in much less time and with much greater safety than with suture, in the following manner: The half of the button that is to be introduced into the gall bladder is first threaded by passing two pieces of surgeon's silk about eighteen inches long through the four drainage openings in the bowl of the button, each thread being passed through two of the openings nearest one another, the four ends of the threads are drawn even and then passed through the cylinder of the button, entering the cylinder at its junction with the bowl. This enables traction to be made on this half of the button after it has been placed in position in the gall bladder, thus permitting a firm approximation and locking of the two halves of the button. The threaded half of the button is inserted into the gall bladder in the same manner as in cholecystenterostomy; an artery forceps is then pushed through the parietal layer of the peritoneum, one-half inch to the side of the incision, grasping the stem of the button inserted in the gall bladder and drawing the stem through the opening made by the artery forceps; pass the traction cord through the other half of button, draw the button together and remove the threads. Sew up original opening in the peritoneum with catgut. You have now secured a firm, permanent approximation of the surface of the gall bladder to the parietal layer of the peritoneum. The gall bladder will drain through the button, and if the button drainage tube is used the discharge can be brought to the surface, without coming in contact with the wound. This operation has the advantage over the suture approximation; 1, in the great saving of time; 2, simplicity and ease with which it can be accomplished; 3, it insures perfect coaptation and no danger of leaking at the side, or giving way, as is the case is with the suture which occasionally causes death; 4, it leaves a large opening. As soon as the pressure atrophy is completed gall stones may be extracted through this opening and a perfect drainage kept up. I am always in favor of performing cholecystenterostomy where it is possible, still if the pathological conditions require a cholecystostomy, this is by far the most simple, rapid and safe means of operating.

V. *Incision of the gall bladder, removing its contents, suturing it to the abdominal wall with immediate extraperitoneal suture of the incision made in the gall bladder.*

I am unable to find but four cases of this kind reported. The operation has never found great favor with surgeons. Of the four

cases operated on, three terminated successfully, and one fatally, a mortality of twenty-five per cent. It was intended to take the place of cholecystendysis, and to diminish the danger by having the suture in the gall bladder extraperitoneal, so that if the suture should give way or leak, the contents would escape on the surface instead of into the peritoneal cavity.

VI. *Cholecystendysis.*—Incision of gall bladder with immediate suture and reposition into abdominal cavity; ideal cholecystotomy. This operation on the gall bladder is a natural outgrowth of the desire of laparotomists to immediately and permanently close the abdomen at the time of the operation as in the intraabdominal treatment of pedicles in gynecological operations. I find thirty-five cases of this kind in the literature, with eight deaths and twenty-seven recoveries, a mortality of twenty-three per cent. The cause of death was: In one case collapse, in two cases anuria with collapse, three with high fever and peritonitis. All of the immediately fatal cases, six, or seventeen per cent, terminated within seventy-two hours after the operation. The remaining two terminated later. What was most feared in this operation was that the stitches would give way under the tension of the gall pressure and that the contents of the gall bladder would escape into the peritoneal cavity. Langenbuch and Tait were very loud in their declaration that this accident would occur, and Tait in his article in the *Edinburgh Medical Journal*, October, 1889, stated that the operation terminated fatally in every instance, while in reality up to that time there had been sixteen operations, with ten recoveries, and in not one of them did the accident, "giving way of sutures," as Langenbuch and Tait had predicted, occur. This is a very noticeable illustration of an error of common occurrence. It shows how erroneous the opinions of great men in surgery may be on operations suggested and performed which are not in line or in harmony with the ones they are accustomed to perform, the calamity which they so forcibly predicted and deemed inevitable was the one that never occurred. While the cause of death was not from giving way of sutures the mortality was great, being about one-third of all cases operated on. This great mortality has rapidly told against the operation, so that it is now rarely performed and is not to be recommended.

VII. Cholecystenterostomy. *Gall Bladder and Intestinal Fistula—Gall Bladder and Intestinal Anastomosis.*—The idea of this operation was suggested by nature in establishing pathologically a fistula between the gall bladder and the intestines. In this way

the surgeon was guided to the best means of relief where an occlusion of the duct was produced by the pressure of an impacted concrement, a neoplasm, a cicatricial band, or any pathological lesion which would render the common duct impervious. While nature had thus blazed the way, surgeons were slow to take advantage of its suggestion. The first one to advise this method was my late friend, the lamented von Nussbaum, of Munich in 1880. He expressed himself in the following words: "When the escape of gall through the natural duct is no more possible, the question arises can we not make an artificial connection between the gall bladder and intestines through which the gall can again escape into the intestinal tract," etc.

The first to work out a feasible plan for the attainment of this ideal result was von Winiwarter. Between the 20th of July, 1880, and the 14th of November, 1881, he had under his care a man, with occlusion of the ductus choledochus, on which he operated six different times, and finally succeeded in establishing a fistula between the colon and the gall bladder, after 16 months of labor. His original plan was to perform the operation in two sittings, but all sorts of difficulties beset his way. It is wonderful what energy and persistence both the operator and patient showed to overcome all impediments. After the publication of his most difficult task it was six years and a half before a surgeon was found who had the courage to undertake a similar operation, when Kappeler undertook to follow in the footsteps of Winiwarter, but to do the operation in one sitting.

In the meantime there were several experiments made on animals, with the hope of discovering a means of making a communication between the gall bladder and the intestine at one sitting. Dr. McFadden Gaston, in 1883, experimented on five dogs, with elastic suture, which was so placed as to approximate the gall bladder and intestines, and around this a row of serous sutures to protect the peritoneum. He hoped by the elastic pressure to produce an atrophy and establish a fistula. The results were unfavorable. In one the dog escaped; two ended in peritonitis; one in abscess between coils of intestine—here the ligature sloughed through into the gall bladder, and left but an extremely small opening; and in one, at the end of the eleventh day, there was found sufficient adhesion and the fistula was established, the ligature being found in the intestine. In 1884 he used a similar ligature on a young dog, in the same manner, with a good result. In 1886 he made several similar experiments, with the addition of ligating the common duct,

but the dogs only lived a few days, dying of extensive gall infiltration in the liver. He deserves great credit for energy and ingenuity as a pioneer in this field.

G. Harley suggested the approximation with the formation of fistula from the gall bladder to the intestine by means of sutures and caustic potash. He arranged a number of sutures in a small circle, about the size of a dollar, holding the gall bladder to the bowel, but before completing the circle mentioned, cauterized the center with caustic potash, then completed the circle with sutures, and in that way hoped to produce a fistula of the gall bladder and hava an adhesion by plastic exudation surrounding it. He claims to have had good success in animals.

Colzi, in 1883, put in a circle of sutures similar to Harley's, but before the final suture, made an incision in the center into the gall bladder and duodenum, also ligating the choledochus. The animals tolerated the operation without any apparent disturbance in the digestive functions.

De Page, in 1887, performed the same experiment as Colzi, on three dogs, without ligating the choledochus. In one the dog ran away; another died of peritonitis; the third was killed at the end of six weeks and showed an atrophy of the gall bladder, but no fistula. Finally, Dastre, in his communication to the Physiological Congress at Basel, in 1889, published his experiments, wherein he succeeded in uniting the gall bladder to the intestine for the purpose of studying what effect it would have on digestion. Of this I shall speak later.

So that we see to the date above mentioned experiments represented three different types. 1. The formation of fistula by chemical destruction. 2. By pressure atrophy, the elastic ligature. 3. Careful suturing with subsequent incision within the circle produced by the sutures.

The priority of the operation certainly belongs to Monastyrski, for he performed his operation about a month before Kappeler, but did not publish it until eleven months after the operation. Of the seven operations performed, four were for carcinoma of the head of the pancreas, one for carcinoma of the duct at its orifice, and two were for impaction of gall stones; those of Terrier and Courvoisier. The technique in all of the above described operations was somewhat similar, the suture being used as the means of approximation, Terrier used a rubber tube to keep the opening patulous which was passed on the eighth day. The seat of the operation in Terrier's case was the duodenum; in Monastyrski's, the jejunum.

2 in. below the duodenum; in Kappeler's, 226 ctm. above the cecum; in Fritsche's case 3 in. below the pylorus.

There remain the cases of Bardenheuer, who performed two operations where he united the gall bladder to the small intestine with an elastic suture in the center and a single row of silk sutures around it, expecting that the elastic suture would produce a pressure atrophy, and that a fistula would remain. The first case, impacted gall stones, terminated fatally at the end of four weeks, and the fistula was not yet established, nor had the gall bladder adhered to the intestine, a biliary fistula opening into the peritoneal cavity. The second he writes to Terrier, was done in the same way, with the same result. To this list, taken from Courvoisier, may be added two by Czerny, one of which died of hemorrhage, and the other from exhaustion; one by Helfreich and one by Reclus, making up to date, November, 1892, in all thirteen cases of chole-

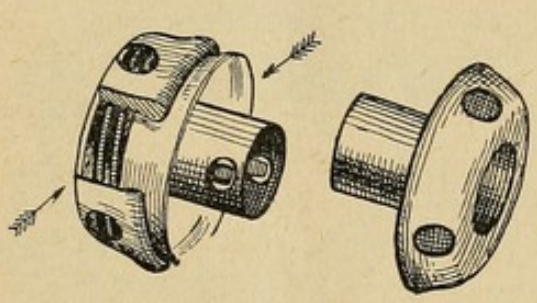


FIGURE 2.—Anastomosis Button.

cystenterostomy of one sitting. Of these six died as the result of operation—Fritzsche's, two of Bardenheuer, two of Czerny, one of Körte, five died as the result of the malignant disease from which they were suffering; and two survived, Terrier's and Courvoisier's; making a mortality of forty-six per cent as an immediate result of the operation.

Since November, 1893, I have collected twenty-three cases with eight deaths; mortality thirty-five per cent.

The various operators in commenting on the technique of the operation, all agree that it is one of extreme difficulty; and while the experience of the others was not as trying as that of Winiwarter, it was always most difficult of performance with suture and occupied an hour or upward to complete the operation.

While reading of the great difficulties experienced by the operators mentioned in performing this operation, I realized that the profession was sorely in need of some more simple and perfect means for the approximation of the gall bladder and the intestine; and, after trying several devices, I succeeded in producing and per-

fecting the anastomosis button, which I think fulfills all of the indications, Fig. 2. The button is inserted in the following manner:

An incision is made from the edge of the rib, two inches to the right of, and parallel to, the median line, extending downward three inches. The gall bladder is drawn into the wound, also the duodenum. The duodenum is cleared of its contents by gentle pressure with the fingers. My short intestinal compression forceps are placed upon the duodenum to prevent the escape of gas and fluids after the incision is made. A needle with fifteen inches of silk thread is inserted in the duodenum, directly opposite its mesentery, and at a point near the head of the pancreas. A stitch is taken through the entire wall of bowel, one-third the length of the incision to be made. The needle is again inserted one-third the length of the incision from its outlet, in a line with the first,

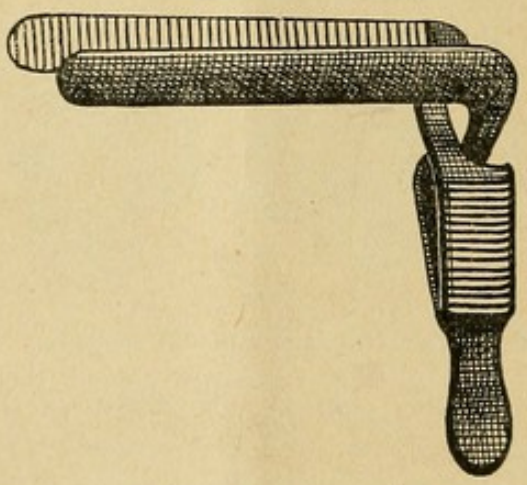


FIGURE 3.—Intestinal Compression Forceps.

and brought out again, embracing the same amount of tissue as the first. A loop three inches long is held here, and the needle is inserted in a similar manner, making two stitches, parallel to the first, in the reverse direction, and one-eighth of an inch from it, coming out at a point near the original insertion of the needle. This forms a running thread, which, when tightened, draws the incised edge of the bowel within the cup of the button. In the gall bladder a similar running thread is inserted. Fig. 4. An incison is now made in the intestine, in length two-thirds of the diameter of the button used. One part of the button is slipped in, the running string tied, and the button held with the forceps. The contents of the gall bladder is withdrawn with an aspirator. An incision is then made in the gall bladder the same length, and between the rows of sutures, the other part of the button is inserted in a similar

manner, and the running string tied. The forceps are removed and each half of button held between the fingers and pressed together, Fig. 5. A sufficient degree of pressure must be used to bring the serous surfaces of the gall bladder and intestine firmly in contact and compress the tissues. The elastic pressure of the spring cup of the button produces a pressure atrophy of the tissue embraced within the cup, and leaves an opening as large as the button, the button dropping into the bowel and being passed through the intestines.

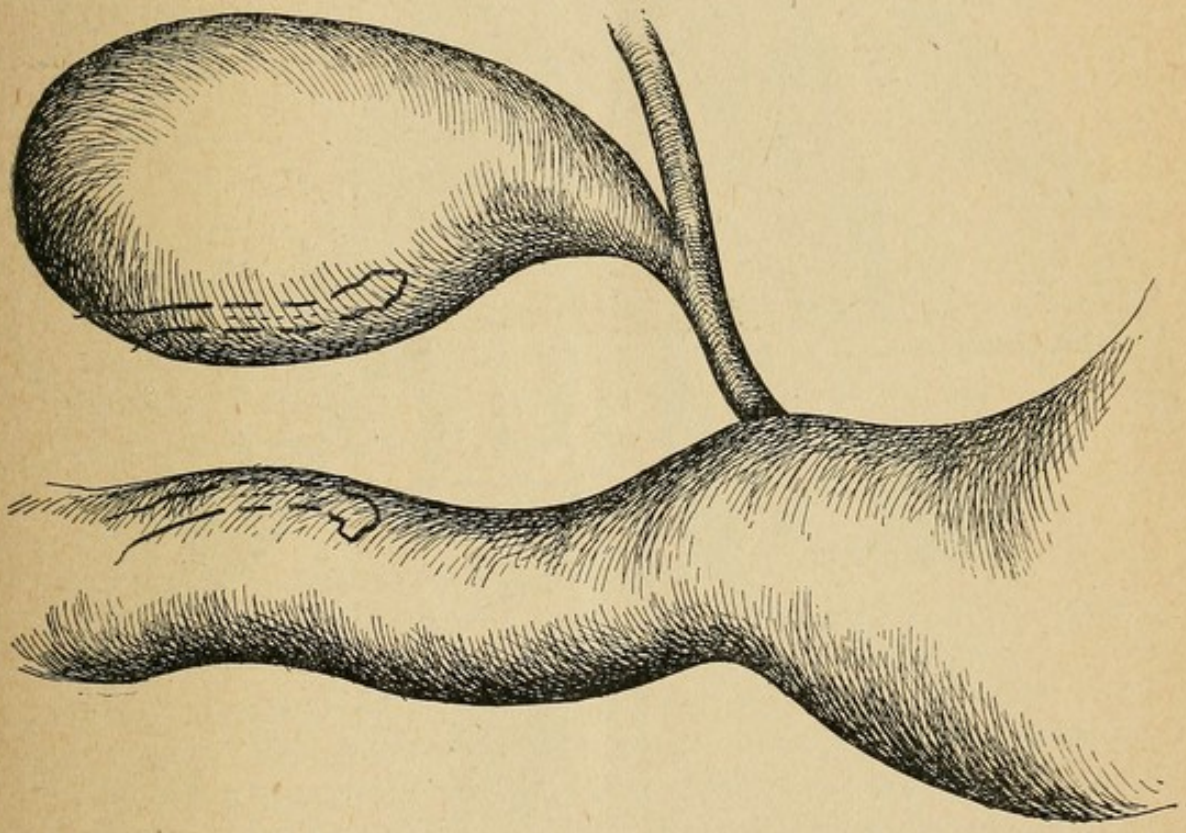


FIGURE 4.—Running threads in position in gall bladder and duodenum.

It takes about as long to describe the operation as to perform it. The time occupied with the first patient on whom I operated was eleven minutes, from the entering of the peritoneal cavity until the closing of it. On dogs I was from eleven to eighteen minutes in performing the operation, the latter time being on the first dog, before I had made the various improvements in the technique and button. The operation is more difficult to perform on the dog than on man, as it is more difficult to bring the gall bladder into the wound.

To show that this operation is one that the busy surgeon will be frequently called upon to perform, now that the technique is

simple, we have only to reflect on the number of cases of chronic jaundice from obstruction of the common gall duct, requiring some operation for relief, and to draw attention to the defects of the operations now in vogue, namely, the unpleasant and sometimes dangerous sequence of cholecystostomy, an external biliary fistula, which may of itself be a menace to life, and require a second

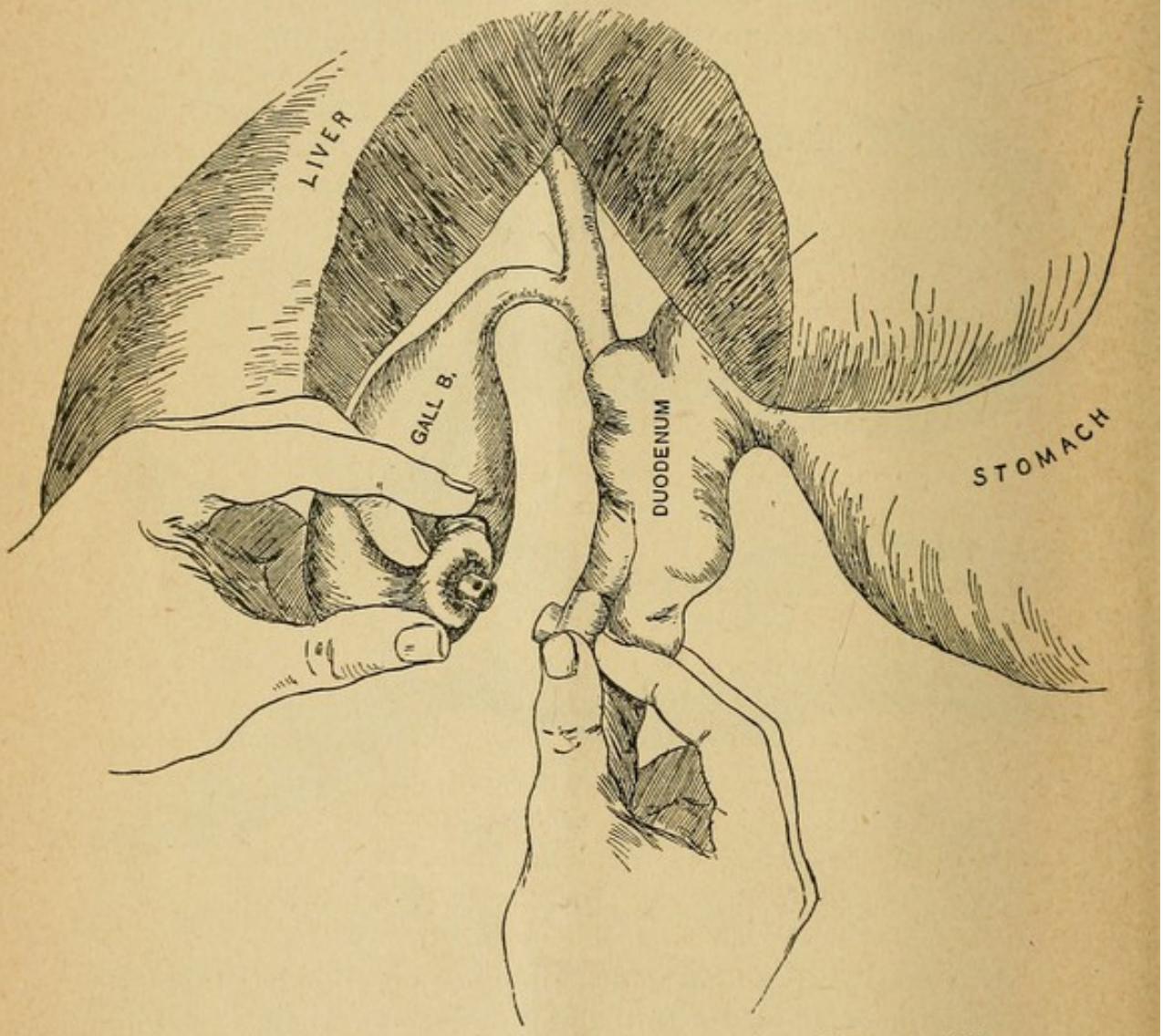


FIGURE 5.—Method of controlling the two halves of button while approximating.

operation even more critical than the first, as is shown in the reports by Courvoisier; also the difficulties and dangers of cholecystectomy and cholecystendysis.

When we consider that in cholecystostomy patients require two operations and that the quantity of bile discharged in each case requires at least two dressings a day for two and one-half months, representing an enormous amount of labor for the

surgeon and attendants and a very protracted and unpleasant convalescence for the patient; also, when we consider that but fifty-one per cent left the hospital with complete recovery, we can see how very much the profession is in need of some better plan of treatment of the lesions of the gall tracts than cholecystostomy by one or two sittings. Take into consideration also the injurious effects of a permanent fistula and we have another very potent reason for abolishing the external opening.

The effect of a permanent fistula of the gall bladder and constant escape of bile secreted, as frequently follows cholecystostomy, is different, depending first, on the quantity of bile that escapes from the opening, and, second, on what proportion is admitted into the intestinal tract. These facts have been lost sight of by many of the surgeons that have operated and had an external fistula remain, which accounts for the great differences of opinion as to the gravity of a biliary fistula. Where the fistula of the gall bladder allows only a portion of the bile to escape, the patient and animal, as in Dastre's experiments, can live without suffering from the loss; that is, they are capable of digesting with a much smaller quantity of bile than they naturally secrete. But if we let the entire quantity of bile escape through a fistula, the patient soon succumbs. This is thoroughly demonstrated by the twelve cases collected by Courvoisier. All patients died where the entire quantity of bile secreted escaped through the fistula, and where a large proportion escaped the patients became emaciated and sick. Therefore a safe means of allowing the bile to reenter the intestines should be welcomed by the surgeon and patient. This operation will produce the same favorable revolution in the surgery of the gall bladder that the intraabdominal treatment of the pedicles did in the treatment of tumors of the uterus and its appendages.

Why should a gall bladder be sutured to the abdominal wall and drained any more than an ovarian cyst should be treated in this manner?

There are reported in all up to December, 1893, twenty-three cases operated on in one sitting all by means of sutures, with a mortality in this operation of thirty-five per cent, or eight deaths in twenty-three cases. From the 11th of June, 1892, up to February 13, 1894, there have been twenty operations of cholecystenterostomy by means of the anastomosis button for the relief of cholelithiasis, with twenty recoveries, 100 per cent, one each by Dr. E. W. Lee, Chicago; Dr. W. J. Mayo, of Rochester, Minnesota; Dr. A. H. Fabrique, of Wichita, Kan.; Dr. Alex. H. Ferguson,

Winnepeg, Manitoba; Dr. W. B. Rodgers, Memphis, Tenn.; Dr. T. D. Lane, Media, Penn.; Dr. Wm. D. Foster, Kansas City; Dr. J. H. Dunn, Minneapolis; Dr. M. H. Luken, Chicago; two by Dr. F. S. Hartmann, Chicago, and nine by myself. In all of these cases the result has been a complete restoration to health and no recurrence of symptoms, as will be seen by the histories. I have had all of my cases and those of Drs. Lee and Hartmann visited in the last week, and they are all in excellent health; in not one did the symptoms return as was feared by Dr. Abbe. There was one operation by this method, by myself, in which the lesion was carcinoma of the pancreas. The duodenum was involved in the carcinoma and could not be used in approximation, a loop of the small intestine was drawn into the opening in the abdomen and approximated to the gall bladder with the button, and the patient died at the end of the fourth day. The post-mortem showed the button in position. It was found that the bowel had been twisted upon itself in the operation and a complete obstruction produced the same as in volvulus. This accident is an impossibility if the duodenum is used for the approximation, and I wish to call special attention to its liability, as it is so easily avoided when it is anticipated. There was a cancer in this involving the greater portion of the pancreas, including the duodenum, and the common duct. The period of convalescence was in all cases very short and the patients were not seriously sick immediately after the operation.

This operation is indicated: 1, in all cases where it is desirable to drain the gall bladder for accumulations therein; 2, in all cases of perforation of choledochus into abdominal cavity where the duct must be obliterated by the reparative process; 3, in all cases of cholelithiasis where obstruction of ducts is present, or where the reflex disturbances of digestion are marked; 4, in all cases, of cholecystitis either with or without gall stones; 5, and in all profusely discharging biliary fistulae, either following operations or as sequelae of pathological changes in gall tract.

The cases in which this operation should not be performed are: a, all cases where the gall bladder is too small for the insertion of the button; b, where the adhesions are so extensive that the bowel cannot be brought into contact with the gall bladder without kinking; c, where the ductus cysticus is obliterated, in which cases the operation of cholecystectomy should be performed where there is an absence of adhesions around the gall bladder; d, where we have an enormously enlarged gall bladder with an elongation of the ductus cysticus, and without an obstruction in

the ductus choledochus, in which case cholecystectomy should be performed. If the ductus choledochus be occluded, the gall bladder should be amputated just above the neck, leaving a sufficient portion in which the button can be inserted in the end, and the approximation made to the duodenum in the usual way. By this operation we provide again a channel for the escape of the bile into the intestinal canal.

REPORT OF CHOLECYSTENTEROSTOMIES BY MEANS OF THE ANASTOMOSIS BUTTON.

Case I. A. Q——, age thirty-five, female; admitted to the medical department of Cook County Hospital, May 27, 1892. Transferred to the surgical division of the hospital, June 10, 1892, and came under my care. Gave the following history: During the last fifteen years has had stomach troubles; pain and tenderness in the epigastrium; the attack would last from two to four days, was almost always accompanied by vomiting, not by jaundice. Had pain in back since childbirth; suffered from chronic constipation. One of these attacks was accompanied by jaundice, December 14, 1891. At that time had constant and intense pain for twelve hours, and an aching pain and tenderness in the epigastrium for two months following it. Jaundice cleared in about two months. During the past few months the attacks of stomach trouble would last from twelve to twenty-four hours. In February the present attack began, accompanied by jaundice and severe pruritus, which has been constant from that time up to date. These symptoms increased in severity up to the time she was admitted into the hospital. While in the medical department her jaundice was constant; her mental condition became very much impaired, and her emaciation rapidly increased.

Condition when admitted to the Surgical Department: The patient intensely jaundiced; very much emaciated; has a point of tenderness in the right hypochondriac region just below the margin of the rib; no tumor to be felt. The urine contains a large quantity of bile, no albumin. The patient suffers from considerable mental derangement, very slight elevation of temperature.

Operation June 11, 1892. I decided to perform cholecystenterostomy by means of an anastomosis button, which device I had used for the first time on a dog, six days previous. An incision three inches long was made, three inches to the right of the median line, extend-

ing directly downward. The gall bladder was found distended, nonadherent, and contained a large number of small calculi. Two calculi were found in ductus choledochus and allowed to remain. Duodenum and gall bladder were both drawn into the wound; an incision was made in the duodenum and half of the button inserted. A running thread was put in the gall bladder, an incision made, and the other half of the button inserted. The gallstones were not removed. There was considerable escape of bile, as gall bladder was not aspirated before putting in the button. The button was then pressed together without any difficulty, and the mass dropped into the abdominal cavity. Time from the opening of the peritoneum until the closing of same, eleven minutes. After the operation the patient showed no unpleasant symptoms; temperature at no time exceeded 100° F., and in fourteen days from the operation she was allowed to walk about the ward. The jaundice rapidly disappeared, and three weeks after the operation there was no trace of bile in the urine. The patient was of a very hysterical temperament after her mental condition improved; she noticed that she was an object of observation and became so erratic that we could not control her at the hospital, and were compelled to discharge her five weeks after the operation. Up to that time she stated that she had "not passed the button." She was apparently well in every particular. The button used in this case was very imperfect compared with the improved one now used.

October 28, 1892. Patient was examined by Dr. H. R. Wittwer. He found the jaundice had not returned; there was no bile in the urine, and the patient was in excellent health. He could not ascertain whether she had passed the button or not.

In December, 1892, this patient began to suffer from pain in the right side and temperature which continued to January, 1893. She was in one of the hospitals in this city. An exploratory operation was made over the site of the former operation, a contracted gall bladder was found firmly and perfectly united to the duodenum. Subsequently the cause of the temperature was found to be an abscess of the lung, not an empyema, which was drained, and the temperature at once disappeared. At no time since the first operation has the patient been jaundiced, nor has there been bile in the urine.

Case II. The following case was referred to me by Dr. Hoelscher, who with Drs. Wiener and Lee, assisted me in the operation. Mrs. B——, age thirty-eight, widow, three children.

Parents still alive, aged seventy-six and seventy-four respectively. Brothers and sisters well; no history of any hereditary disease.

Dr. Hoelscher saw the patient for the first time October 7, 1892, and found her as follows: "Healthy, well nourished appearance; pain of sudden onset in the epigastric region, and from this point it gradually extended over the whole abdomen. She had vomited the contents of the stomach and some bile on two occasions after the seizure with pain. Bowels were constipated and had been in this condition two or three days before the attack. Vesical tenesmus and diminished quantity of urine. Gave no history of any previous pain, gastric disturbance, jaundice or colics."

On examination found a tumor in right hypochondriac region, extending downward into the iliac region and terminating in a rounded smooth end; could be distinctly felt in lumbar region, was movable and tender on pressure; there appeared to be a deep fissure between the tumor and the liver, no fluctuation apparent, bowel or colon not overlying the tumor. The diagnosis could not be determined, but it was presumed to be some lesion of the kidney, so it was decided to make an exploratory laparotomy.

Operation, October 19, 1892. I made an incision three inches long, from the edge of the tenth rib directly downward toward the border of the ilium. The tumor was exposed and found to be a very much enlarged gall bladder containing large calculi. The viscus was edematous, red and thickened. It was decided to make a cholecystenterostomy with the anastomosis button, No. 2. The gall bladder was aspirated, and the running thread inserted. The running thread was then inserted into the duodenum and the intestine incised and the male half of the button placed in position; the female half was then placed in the gall bladder through a slit made between the running thread, and the button closed. The gall bladder measured at least one centimeter in thickness and was very edematous. There was no difficulty in inserting the button. The gallstones were allowed to remain, as I do not consider it necessary to remove them unless they are larger than the button. They will pass out after the button escapes.

October 20. Temperature, 101° F.; pulse, 96. Vomited considerably during the night and complained of headache, which seemed to be effects of anesthetic. There was no pain nor abdominal tenderness.

October 21. At 5 P. M. yesterday the vomiting ceased, and the patient is feeling very well this morning.

October 27. The patient has had no unpleasant symptoms

since October 20. This morning, eight days after the operation, two large gallstones were found in the stool. The larger one weighed 117 grains, 7.8 gm.; its longest diameter one inch, its shortest seven-eighths inch. The second stone 102 grains, 6. 8 gm.; its longest diameter seven-eighths inch, its shortest three-fourths inch. It will be noticed that the shortest diameter of the larger stone measures exactly the same as the diameter of button used. The patient is feeling very well and is sitting up in bed. Complete primary union. Button passed eighteen days after operation.

August 20, 1893. The patient has excellent health and not the least symptom of her previous trouble.

Case III. This case was referred to me by Dr. J. H. Hoelscher, who gave me the following history: "Mrs. Z——, age thirty-six, married, six children. Enjoyed perfect health until twenty-two years of age; at that time, three months after childbirth, had an attack, of short duration, of severe epigastric pain and vomiting. It was not accompanied or followed by jaundice. Ever since that attack she has had digestive disturbances, as distress following certain kinds of food, eructations of gas, constipation, loss of appetite. Four years ago she had a similar attack of pain in the epigastrium, accompanied by vomiting. From that time on the pain returned every five or six weeks, up to five months ago, when she noticed a constant aching pain and tenderness in the right hypochondriac region, that persisted until the present time. The pain and soreness was very much increased after working in a stooping posture. She has suffered much from general debility, and complains frequently of slight chills. Throughout the entire progress of her disease jaundice was never present. The urine was tested several times with negative results. She does not give a distinct history of having had hepatic colic.

"About three months ago she found small particles the size of mustard seeds, in the feces, which some one told her were gallstones. There is no positive evidence that she ever passed a gallstone. Physical examination revealed heart and lungs normal; liver not increased in size. Manipulation reveals a pear shaped, hard tumor in the region of the gall bladder, measuring about three inches in length, and two in width. It moves synchronously with the diaphragm in respiration. On pressure considerable pain is produced, and a slight creaking sensation is felt by the fingers.

It can be separated from the kidney, and can be moved considerably from side to side."

The diagnosis of gallstone was made by Dr. Hoelscher, and the case was referred to me for operation.

Operation, November 23, 1892. Assisted by Drs. Hoelscher and Lee, in the presence of Dr. Nicholas Senn, Dr. Dunn, of Minneapolis and Drs. W. J. and C. H. Mayo, of Rochester, Minn. The incision was made the same as in Case II.; a contracted gall bladder packed full of gallstones, slipped into the wound. A little difficulty was experienced in drawing the duodenum forward, as some old adhesions existed. The running threads were inserted in gall bladder and duodenum; male half of button placed in duodenum, and held by an assistant. An incision was made in the gall bladder, which was found so full of gallstones that half of the button could not be inserted without removing some of them. A dozen were quickly picked out with the dissecting forceps. About twice as many were allowed to remain. The female half of the button was inserted in the gall bladder, and the running thread tied. Button pressed together. Toilet of field of operation was made with dry gauze, and the viscera dropped back into the abdomen. Deep and superficial rows of sutures in abdominal wall. Time for entire operation twenty-one minutes. The time for inserting the button was not taken. Patient rallied rapidly from the anesthetic. Pulse after operation 70; temperature normal. Neither nausea nor vomiting.

November 25. Pulse, 78; temperature, 100.5° F. Patient complains of slight pain at seat of operation. No tympanites nor abdominal tenderness.

November 28. Patient expresses herself as feeling very well. At no time since the operation has patient's temperature exceeded 100.5° F. She is allowed to take a quantity of liquid nourishment, but not sufficient to satisfy the appetite. I consider her now out of danger. Dr. Hoelscher is to be congratulated on his diagnosis in this case in the absence of so many important symptoms.

August 20, 1893. Dr. Hoelscher reports to me that this patient has enjoyed better health since the operation than she had for years previous. Not one of the symptoms returned.

Case IV. Mrs. F——, Referred to me by Dr. Hoelscher, who furnished me the following history:

"Patient age fifty-six, married, has several children. For the last four years has suffered from attacks of difficult breathing and palpitation. These attacks were usually accompanied by pain

and tenderness in the right hypochondriac region. On three or four occasions in the past year has had colic, and most of that time was unable to work and was confined to her room. These attacks were never followed by jaundice, or vomiting. Never passed gallstones. On December 11, 1892, patient had a severe attack of pain with vomiting, and great tenderness on pressure in the right hypochondriac region. This continued up to the time of the operation, but no jaundice was present, and no bile in the urine." Dr. Hoelscher requested the operation of cholecystenterostomy.

Operation December 18, 1892. Dr. Murphy, assisted by Drs. Hoelscher and Lee, performed cholecystenterostomy by means of the button. A number of gallstones were removed. The button was easily inserted. The abdominal wound dressed. The patient was removed from the table in excellent condition. Her convalescence was uneventful.

August 20, 1893. Patient called at office and reported that she has enjoyed better health since the operation than for years. Has not had a recurrence of the dyspnoea or palpitation. Has gained very much in weight and strength. No recurrence of pain.

Case V. Mrs. D. W——., Called to see patient by Dr. T. J. Conley, who furnished the following history: "Patient, widow, age fifty-four. Has had several attacks of pain in the right hypochondriac region for the past two years. Two weeks before the present attack suffered from a severe purulent bronchitis and was much emaciated by it. Shortly after the bronchitis subsided, she had an attack of pain and pressure in the right hypochondriac region. She never had an attack of jaundice.

"On examination January 29, 1893, patient emaciated; suffering from bronchitis, pain and tenderness in the right hypochondriac region; a small tumor can be felt in the same region. It is movable and can be separated from the kidney."

Operation January 31, 1893. Dr. Murphy, assisted by Drs. Conley, Lee, Hartmann and Wittwer, performed cholecystenterostomy. There was no difficulty in inserting the button. Time nineteen minutes. The patient suffered very much from vomiting for five days following the operation. Button passed on the twenty-eighth day after the operation; two stones were also passed. Highest temperature after operation 100.5°F. This was attributed to the bronchitis.

Dr. Conley, under date of May 8, 1893, wrote me the following:

"Mrs. D. W., on whom you performed cholecystenterostomy,

is strong and enjoying very good health. Several times within the last two weeks she has walked two miles without fatigue. There is no tenderness or pain at the seat of the operation."

Case VI. History and particulars furnished by Dr. E. W. Lee, in whose practice this case occurred. "Mrs. L——, age forty-eight, married. At intervals in the last three years patient has suffered from severe attacks of colic, accompanied by nausea and often vomiting. The pain was always located in the right hypochondriac region and often in the 'pit of the stomach.' These attacks would last for several hours, and then would suddenly disappear, leaving a soreness at the seat of pain. They were never accompanied by jaundice until the present attack, which began February 14, 1893, six days before operation. This attack was more severe and prolonged than any of the previous ones. The vomiting was very severe. The tenderness over the gall bladder was extreme.

"Operation February 20, 1893. Dr. E. W. Lee, assisted by Drs. Murphy, Hartmann and Wittwer, performed cholecystenterostomy by means of the button. The gall bladder was very much contracted, and there were many adhesions. The adhesions were separated and a medium sized button inserted, producing a perfect approximation. Seven small stones were removed at the time of the operation. The recovery was uneventful. Patient passed the button March 6, fourteen days after the operation. A number of small stones were passed subsequently.

"August 26, 1893. Patient has been able to work more since the operation than for three years previous. Has had no colic or digestive disturbances."

Case VII. Dr. William J. Mayo, Rochester, Minnesota, in a personal letter furnished me the following history: "W. H——, Racine, Minn., American, male, aet. 71. Patient gave a history of colics for two years, jaundice for two months; great debility, cholemia, white stools, etc.

"Operation April 6, 1893, by Dr. W. J. Mayo, assisted by Drs. C. H. Mayo and S. Plummer. Usual incision for operation on gall bladder. No stone found in gall bladder; obstruction in common duct. Cholecystenterostomy by Murphy button. Bladder could not be brought to surface, obstruction could not be removed; the button was readily placed in position; no unpleasant symptoms since the operation."

This is a remarkable case on account of the age of the patient,

and the doctor deserves great credit for operating on a patient so debilitated at the time of the operation.

Case VIII. From Dr. Wm. D. Foster, Kansas City, Mo. "Mrs. A. M. S——, aet. 58. Diagnosis, cholelithiasis. Operation Nov. 23, 1893, cholecystostomy. Gall bladder contained more than one pint of fluid consisting of mucus and bile; six hundred and twenty-six gallstones removed which weighed six drachms. Gall bladder was sutured to abdominal wall; subsequently the fistula was closed with wire sutures; operation unsuccessful.

"Operation April 28, 1893, cholecystoduodenostomy by means of the Murphy button. No attempt was made at the time to close the fistula.

"Aug. 13, the fistula completely closed without operation. The bile discharged into the intestine."

Case IX. M. D——, Alexian Brothers Hospital. Transferred to my service by Dr. Hoelscher. Age 42, male, single. Several weeks ago he began to have pain and a sense of pressure under the border of the right ribs. This was sometimes accompanied by severe pain, with nausea and vomiting, but no jaundice. One week ago the pain became very much more severe, and was soon followed by jaundice. Shortly after the jaundice appeared the pain ceased, but the tenderness remained over the region of the gall bladder.

Status praesens. Icterus very marked, large quantities of bile in the urine, feces acholic. Tongue dry and brown; temperature 100.4°F; pulse 86, full and regular. The patient very tender over the lower margin of the right costal arch. An induration could be felt, but the gall bladder could not be outlined.

Diagnosis: Cholelithiasis with occlusion of choledochus.

Operation May 6, 1893. The patient acted very badly under chloroform, so it took ten minutes to open the peritoneal cavity. The gall bladder was aspirated and joined to the duodenum with the button in ten minutes, and ten minutes was consumed in making the toilet and suturing the wound, making thirty minutes in all. A small stone was removed from the gall bladder, but the obstruction in the common duct was not disturbed. The patient made an uneventful and rapid recovery. The jaundice rapidly disappeared after the operation. The patient was up and about the ward on the fifteenth day. Voided the button on May 22, sixteen days after the operation. The urine showed a negative reaction for bile May 14.

August 15, 1893. The patient reported at the hospital. Has

gained very much in weight and is enjoying excellent health. No return of his symptoms.

Case X. Mrs. B——, Rock Island, Ill., admitted to St. Joseph's Hospital, May 13, 1893. Patient was very much emaciated from an illness extending over a period of six weeks. In the last two years suffered from frequent attacks of pain in the right hypochondriac region, accompanied by vomiting. These attacks were not followed by jaundice, except the last one, which began six weeks ago. This attack continued with severe pain, vomiting, great tenderness over the region of the gall bladder. The temperature was of an intermittent character, fluctuating every other day from 99° F. to 103° F. On the intervening day no temperature. The elevation of temperature was frequently, but not always, preceded by a chill.

Status praesens. Patient slightly icteric, very much emaciated, pulse 120, feeble but regular. Urine contains a considerable quantity of bile; patient is nauseated when she sits upright. The attacks of pain come on every few hours and are of a distinct colicky character. There is present a tumor extending three inches below the margin of the ribs in the right hypochondriac region, and about three inches in diameter; it moves synchronously with the diaphragm in the respiratory act, and is very sensitive on pressure. It can be separated from the kidney, which is situated below and behind, and does not move with respiration.

Diagnosis: Cholecystitis—impaction in the ductus choledochus.

Operation May 22, 1893, Dr. J. B. Murphy assisted by Drs. Lee, Hartmann and Wittwer. Cholecystenterostomy by means of anastomosis button. The operation was performed without difficulty; time, 13 minutes. A few calculi were removed at the time of the operation.

Subsequent History. There were no unpleasant symptoms in the subsequent course of the case; patient was discharged from the hospital on the fourteenth day after the operation. Button passed eighteen days after operation.

August 27, 1893. Patient has increased very much in weight, is enjoying excellent health, attending to all her household duties, and has had no return of the symptoms.

Case XI. Dr. A. H. Fabrique, of Wichita, Kansas, in a personal letter, under date of July 20, 1893, writes the following:

"Enclosed please find report of patient on whom I performed cholecystenterostomy by means of your button.

"Mr. R——, aet. thirty-eight, farmer, weight 180 pounds. Had been subject to attacks of hepatic colic. Came under my observation about the middle of May, 1893. Had been suffering for two weeks previous to that time with severe pain in the region of the liver, for which he was taking one-third grain of morphine three to six times a day. Jaundice all over the body for a whole week prior to the time he consulted me.

"Operation, June 1, 1893. Found the wall of the gall bladder so thickened that it was difficult to fasten the button into the bladder. I used the smallest button; duration of operation thirty-five minutes. Closed the opening with silk sutures through the entire abdominal wall. Temperature did not rise any time above 99.5°F. Union per primam. There was marked improvement on the third day; skin commenced to clear up; no hepatic pain after the operation. Stools changed from white to a natural color; button passed on the twenty-first day. At the present time the man is perfectly well, pursuing his usual avocation."

Case XII. Under date of July 20, 1893, Dr. W. B. Rogers, of Memphis, Tenn., states that immediately after his return from the National Association of Railway Surgeons at Omaha, he had an opportunity to use the button in the operation of cholecystenterostomy.

The following is a report of the case as furnished me by Dr. Rogers: "W. A. E——, male, fifty-eight years of age. Presented April, 1893, all the physical signs of an enlarged liver; area of dulness occupying the epigastrium. No bile in the stools. Icterus marked; emaciation very pronounced; temperature 98°F.; pulse 68. Diagnosis: 'Cancer of liver,' had been repeated by several physicians and case pronounced hopeless. The enlargement of the liver was of only a few months' duration. The extreme rapidity of growth aroused suspicion of nonmalignancy. Exploratory incision revealed distended gall bladder. Eighteen ounces of mucopurulent bile; occlusion common duct, with consequent retention and congestion of liver. No evidence of malignant disease could be detected; nor could a calculus be detected in common duct. Cause of obstruction not discerned. Patient's condition urged a rapid completion of all operative procedures, hence fistula was established. Patient recovered from operation. Fistula discharged at least two pints of bile per day; icterus disappeared. General condition continued bad. Absence of bile in bowel kept nutrition below par.

"Operation, June 1, 1893. I reopened abdomen and united small intestine to gall bladder by means of Murphy's button; did not

attempt to close the fistula; tied thread to the button, and on the tenth day removed the button through the fistula. No reactionary fever nor bad symptoms other than that of depression due to shock. Patient gradually improved, and at the end of eight weeks was able to be up and about the house gradually gaining strength. Fistula has contracted, so that dressings only need changing every third day. Stool contains bile; appetite and digestion steadily growing better, and evident gain of flesh. I found the application of the button quite readily accomplished; the coaptation of parts perfect, and the results are as stated."

Case XIII. This case occurred in the practice of Dr. F. S. Hartmann who furnished the following report: "M. McC——, age 60, widow, multipara. About eight years ago she had a severe attack of colicky pain in right hypochondriac region; pain was intense and lasted about three days. Patient was jaundiced during this attack; she does not remember any other symptoms.

"In March, 1893, she had a second attack, colicky pains in hepatic region and epigastrium, vomiting, chills, fever, jaundice; sick about one week. Patient came from Philadelphia to Chicago on a visit last April; since her arrival she has had nearly a dozen attacks of pain which would last from six to twelve hours, and have always been followed by great prostration. The last attack began at 1 A. M. July 13, 1893; colicky pains, great tenderness over upper half of abdomen, more marked in region of gall bladder; jaundice, persistent vomiting, temperature 100°-101°F, bile in urine, clay colored passages.

"Operation, July 18, 1893. Cholecystenterostomy with Murphy button, performed by Dr. F. S. Hartmann, assisted by Drs. Murphy, Lee and Wittwer; time seventeen minutes. After operation patient's condition was excellent, and her recovery was uninterrupted. Pulse always below 100 and good; temperature never ran above 99.8°F., and attacks of colicky pain ceased. Vomited once or twice daily for three days; vomited matter containing bile. Forty-eight hours after operation gauze drain was removed from peritoneal cavity. Bile gradually disappeared from urine, and feces regained their color. At no time was there any great tenderness in region of operation. Button and fourteen calculi were passed in one stool on the fourteenth day after operation. Greatest circumference of largest calculus $2\frac{5}{16}$in; smallest circumference of largest calculus $2\frac{3}{16}$ in; circumference of button $2\frac{3}{16}$ in. Patient sat up on the nineteenth day after the operation.

"August 29, 1893. Patient enjoying excellent health, better than at any time since her second attack of colic."

CASE XIV. In a personal letter to me, Dr. Alex. Hugh Ferguson, of Winnepeg, Manitoba, under date of August 14, writes the following:

"Operation, August 3, 1893, I used your button in uniting the gall bladder with the duodenum—cholecystoduodenostomy. Patient passed the button on the eleventh day, and her condition is excellent. The case was difficult to manipulate owing to the short build and large amount of fat (fully three inches) in the abdominal wall. It was a case of dropsy of the gall bladder. One stone was removed from it, another was felt to occlude the duct."

August 28, 1893, I received a report of this case through Dr. McArthur, of Winnepeg, who had assisted Dr. Ferguson at the operation; he states that the patient is in excellent health, and that Dr. Ferguson expressed himself concerning the button in the following words: "It is the greatest innovation in abdominal surgery since that of antisepsis."

CASE XV. From Dr. T. D. Lane, Media, Pa. "Mrs. L——, aet. forty-five, married, one child. In October 1892, was taken ill with intense abdominal pain, paroxysmal in character, accompanied by vomiting and constipation. Jaundice appeared on second day, also bile in urine; stools acholic; on sixth day severe chill followed by temperature of 104° F. As the jaundice was of the most marked type, coming on suddenly with no previous history of trouble or emaciation, vomiting or pain and the temperature and chills persisting for several days, I sent the woman to the Jefferson Hospital under the care of Prof. I. C. Wilson with the diagnoses of acute obstructive jaundice and Charcot's hepatic fever, with the hope that an early operation at least of an exploratory character would be performed. She remained in the hospital nineteen weeks. The chills and jaundice persisted; she emaciated rapidly; she was seen in consultation by Drs. Keen and Brinton. Operation was deferred on account of the woman's weak condition and the possibility of malignant character of the obstruction. The fever and jaundice finally disappeared and she was discharged from the hospital February 1, 1893. She gained rapidly until July 15, when I was called to see her again. The vomiting, chills and fever had suddenly returned. I determined to perform cholecystostomy at once. This I was able to do without much trouble in an operation of one sitting. I removed a very large stone marked with numerous facets. I could not discover the presence of anoth-

er in the common duct with my finger through the foramen of Winslow. Supposed the obstruction was due to cicatricial contraction. Temperature dropped to normal the following day. In a month she was up and about. Still the stools remained clay colored and she suffered much from gaseous distention of the bowels. She was also greatly annoyed by the voluminous discharge of the bile upon the surface. I determined to close the biliary fistula.

"Operation, September 20, 1893. I made a Y-shaped incision over the old cicatrix, pushed the great omentum aside and drew out a small knuckle of intestine and performed cholecystenterostomy, using the smallest sized Murphy button. The fistulous tract was curetted and closed at once with a circular stitch. The abdominal wound was closed without drainage. The temperature remained between 99½° and 100½° F. for several days. Otherwise she made an uninterrupted recovery. On the fifteenth day the button was found in the stool. Since then she has been in very good health, able to attend to all her duties and has gained twelve pounds in weight."

Case XVI. Report of operation given by Dr. J. Frank in whose service at St. Elizabeth's Hospital the case occurred. "Patient admitted at Hospital as a 'Perityphlitic Abscess.' Careful examination showed that it was a very much distended gall bladder. An incision was made directly over the tumor. The gall bladder was found adherent and was immediately incised; 143 stones were extracted, and the opening allowed to remain. Patient was discharged with a fistula. Returned several months after with a large quantity of bile discharging from fistula, probed and found stone; removed. The canal leading to bowel could not be entered. The discharge continued in large quantity and the patient was losing strength. It was decided to perform a cholecystenterostomy to allow the secretion to enter the bowel in large quantity.

"Operation Oct. 20, 1893 by Dr. M. H. Luken. An incision was made at the side of the fistula. The gall bladder which at the time of the first operation, was a large distended sac, had now, four months later, contracted to a tube not much larger than a finger and was adherent to the surrounding tissues. It was difficult to expose a sufficient surface of the gall bladder to insert a button. The button was finally placed in position and the duodenum united to the gall bladder. The button passed on the 13th day without pain. An operation has not yet been performed to close the ex-

ternal fistula. A patulous opening now exists between the gall tracts and duodenum."

The difficulty of performing the operation of cholecystenterostomy under these conditions was extremely great and as Dr. Frank expresses it "I do not think that the operation could have been performed by any other means than the button."

Case XVII. Dr. F. S. Hartmann furnished me with the report of this case that occurred in his practice. "Patient states that about five years ago he had an attack of painful stomach trouble; it was not accompanied by nausea or vomiting. The illness lasted about one week. On August 23, 1893, patient experienced a dull aching pain in pit of stomach which lasted two days; then suddenly became much worse and of a colicky nature and was accompanied by persistent vomiting of bile and mucus. The colicky pain lasted two days and was very intense. The patient has had eight similar attacks since. A characteristic feature of all his attacks has been the peculiar manner in which three symptoms have followed each other:

"First, acute colicky pain;

"Second, a burning sensation in chest and throat;

"Third, persistent vomiting.

"He suffered from digestive disturbances for fifteen years. During an attack occurring September 29, a trace of bile was found in urine. Patient was never jaundiced. No calculi were ever found after an attack. Diagnosis, cholelithiasis, obstruction of cysticus.

"Operation October 26, 1893, by Dr. F. S. Hartmann, assisted by Drs. Murphy, Wittwer and Lee. Cholecystenterostomy by means of Murphy button. Gall bladder somewhat enlarged. Time for insertion of button seven and one-half minutes. Time for entire operation, twenty-six minutes. Convalescence uneventful. Button passed on ninth day."

Case XVIII. W. B——, aged forty years, cigar maker. Three years ago had first typical attack of gallstone obstruction, accompanied by jaundice. Since that time has had five similar attacks; last one began about two weeks ago; was less severe than previous attacks.

Operation November 7, 1893, by Dr. Murphy. Cholecystenterostomy by means of anastomosis button, smallest size. Gall bladder was found distended; gallstones not removed. Time from beginning of operation to completion of anastomosis eleven minutes. Patient acted very badly under anesthetic; ether. Had some bronchitis following operation; aside from this his convalescence

was uneventful. Was about the ward in three weeks. Jaundice had completely disappeared.

Case XIX. By Dr. James H. Dunn, Minneapolis, Minnesota. "Mrs. W——, age thirty seven, suffered from attacks of gall colic every three or four months for the past four years. They were accompanied by vomiting, jaundice, constipation, clay colored stools. The last attack has continued for about eight weeks, necessitating the use of large doses of morphine all the time.

"Operation January 6, 1894. Median incision, found the gall bladder normal size, and nearly full of stones, duct impacted with small ones. Cholecystoduodenostomy with the Murphy button; patient's only complaint after operation was pain on deep inspiration, temperature reached 100°F. once; button passed on the eighteenth day, and with it twenty-six stones. Patient made an uneventful recovery.

"In these days it is pretty hard to say where we are in surgery but I am very sure the Murphy button has come to stay."

Case XX. Case referred to me by Dr. J. H. Hoelscher, who had made the diagnosis of cholelithiasis. Mrs. F. H——, age thirty-six; married; two children; has been sick for twelve years; has had attacks of colic every two or three months in that time, not always accompanied by vomiting, never by a typical jaundice although occasionally there has been a slight icteric discoloration of the skin, great digestive disturbance, no tumor to be felt.

Operation February 13, 1894, by Dr. J. B. Murphy. Incision from ninth costal cartilage; gall bladder adherent to duodenum, liberated, brought into wound, puckering string placed in position, incised, and two stones three-fourths of an inch in diameter removed, some viscid mucus but no bile escaped, button placed in position in gall bladder and duodenum, and closed; no drainage. Time of operation, eleven minutes, convalescence uneventful, patient did not even vomit from the anesthetic, and temperature did not exceed 99°F.

VIII. *Cholecystectomy, Total Extirpation of the Gall Bladder.*— This operation was introduced by Dr. Langenbuch. At first there was most bitter opposition to the operation, but it has now obtained great recognition. For a certain class of cases it is the operation par excellence: 1, on account of its safety; 2, because it completely fulfils the indications. Langenbuch is sustained in the theory of his operations by the fact already mentioned, namely:

Absence of the gall bladder being harmless, as far as the health of the patient is concerned, as demonstrated by the large

number of animals and men in which this viscus has been found to be congenitally absent, and made no apparent difference in their health. I have found in dogs, on which I have performed this operation, that their health was not interfered with in the slightest.

The only question of gravity for the consideration of the surgeon, as long as its absence does not materially affect the patient, is: What are the dangers of the operative procedure itself? That these dangers are not great is shown by the following statistics: We have collected in all sixty-five cases; there were eleven deaths, a mortality of seventeen per cent, which is even more favorable than cholecystostomy, and this operation is rapidly finding favor with surgeons, notwithstanding the assertions of Tait when the operation was first suggested in May, 1884, that it was "absurd;" in June, 1885, that it was "radically absurd," and in October, 1889, that it was "intrinsically absurd," (Courvoisier); another illustration of how valueless a man's opinion may be of an operation that he has not tried. The indications for this operation are: 1, hydrops and empyema of the gall bladder when it is already disconnected from the choledochus by occlusion of the ductus cysticus; 2, in severe chronic recurrent cholelithiasis vesicularis; 3, in severe diseases of the wall of the gall bladder itself, ulceration, gangrene, contraction and carcinoma; 4, in internal rupture or wounding of the gall bladder when suture is difficult or impossible. It is contraindicated by strong adhesions to its surroundings; by broad and close attachments to the liver; in all permanent closures of the choledochus.

IX. *Choledocholithotripsy, or Crushing of Gall Stone in the Choledochus.*—The operation has been performed three times with success, by Credé, Courvoisier and Kocher. It was found in these cases that there were fragments after the crushing that would not pass through the choledochus but might regurgitate back into the gall bladder. There is also no certainty that the remainder of the canal is patulous below the point where the fragments lodged. Credé's patient had severe attacks of colic and fever in passing the fragments. Again, there is danger in the act of crushing the stones of injuring the walls of the duct so as to subsequently cause a perforation; for these reasons this operation should not be performed.

X. *Choledocholithectomy, with subsequent suture of duct.*—This operation has been performed five times with two deaths, giving a mortality of forty per cent. It is a very difficult opera-

tion to perform as the duct is deeply seated and the escape of bile in the field of operation after the incision is very annoying to the operator. This operation was first performed by Courvoisier, and he deserves great credit for his ingenuity and courage in devising and undertaking this operation, as well as being the first to perform a successful cholecystendysis, and to do the first successful choledocholithotripsy.

This operation is to be undertaken, 1, Where the stone is large and firmly impacted in the duct and when the patient has symptoms of intermittent fever and chills. 2, Where the stone is impacted in the duct and the ductus cysticus is obliterated, preventing the formation of a gall bladder and intestinal fistula for the escape of the bile. 3, Where it has produced ulcerative perforation and the wall at the opening is in a healthy condition, otherwise the gall duct should be excised at that point, both ends ligated and a cholecystenterostomy performed.

The following operation was performed:

Case I. Mrs. Matilda B——, age thirty-five, multipara, admitted to hospital Sept. 20th, 1893. Enjoyed perfect health until three years ago, at that time had first attack of colic, intense pain of sudden origin in right hypochondriac region, very sensitive under right costal cartilage, pain continued several hours, followed by vomiting; was not followed by jaundice. Two years later similar attack with no jaundice. Five weeks ago had third attack. Has had frequent severe attacks of pain since the beginning of the last one a week ago, which have continued to the present time, October 20, 1893. Jaundice made its appearance for the first time four weeks before admission, and is still present. She does not know that she ever passed a gall stone. Never had any urinary difficulty. Stomach always good. Was never free from tenderness in right epigastric region since time of first attack. Present condition; very icteric, rapid feeble pulse, expression of severe suffering, complains of great thirst, anorexia. Very sensitive in right hypochondriac region. No tumor perceptible. Temperature, 103° F.; pulse, 138; respiration, 34. Diagnosis:—Hepatic calculus impacted in ductus choledochus. October 21, 8 A. M., pulse, 100; temperature, 102.8° F.; respiration, 36; P. M. pulse, 102; temperature, 103° F.; respiration, 36. October 22, P. M. pulse, 96, temperature 102°F.; respiration, 40. October 23, A. M., pulse 94; temperature 99°F.; respiration, 30.

Operation October 23, 11 A. M. Dr. Murphy, assisted by Drs. Hartmann, Wittwer, Kortebein, performed laparotomy; found

gall bladder contracted to a tube, large calculus one-half inch in diameter situated in the middle of choledochus. Gall bladder could not be utilized for approximation to the intestine. It was decided to remove the calculus from the common duct, which was thoroughly exposed. An incision one-half inch long was made in the duct, parallel with it, stone extracted. The opening in duct was united with continous suture. Gauze drainage. Time forty-five minutes. There was but very little hemorrhage during operation, and none whatever after suturing. Some shock. Pulse, 11:40 A. M., immediately after operation, 64; respiration 30; 5:30 P. M. pulse 72; temperature 97°F.; respiration 32; 10 P. M. pulse 78; temperature 97.4°F.; respiration 32.

October 24, 8 A. M., pulse 94; temperature 98.8°F.; respiration 32. Rested well during night; nauseated, but no vomiting since operation. October 24th, 6 P. M., pulse 144; temperature 103° F.; respiration 36.

October 24, 12 P. M., pulse 108; temperature 101°F; respiration 26. Condition much improved; pulse still feeble.

October 25, 2 A. M., pulse 110; temperature 102° F.; respiration 35. Pulse very weak. Died at 3 A. M., very suddenly.

Post-mortem not allowed. It is therefore impossible to say what was the cause of death.

The clinical cases requiring surgical interference in lesions of the gall tracts are the following:

First, in all cases of obstructive jaundice, where the jaundice exists during a period of two weeks.

Second, in all recurrent cases of obstructive jaundice.

Third, in cases of recurrent cholecystitis.

Fourth, in recurrent cases of colic from cystic duct obstruction, always without jaundice.

Fifth, in retention cysts of gall bladder.

Sixth, in malignant growths of gall bladder.

Contraction of the gall bladder occurs in more than eighty per cent of the cases of cholelithiasis. It is the result of the cicatricial contraction produced in the gall bladder by a chronic inflammation or irritation of it by the gallstones; therefore the earlier the operation is performed, the less liable we are to find contraction. There is another danger and that a serious one; perforation of the tracts by the calculus. I have been called in consultation within the last eighteen months in three cases of perforation of the gall tracts, all attended by an infective peritonitis and all died; a history of repeated attacks was given in each. In one case the

patient had the question of operation under advisement on account of the frequency of attacks. None of them were suffering from colic or obstructive jaundice at the time of the perforation, which shows that there is danger even in the quiescent stage.

Another reason for the early operation is the danger of a malignant growth being produced by the constant irritation. In looking over the records of the pathological institutes we find abundant proof that a considerable percentage of cases of cholelithiasis terminate with carcinoma of the gall tracts. I have seen a large number of post-mortems presenting this condition.

These reasons, along with the dangers which accompany an acute attack of obstructive jaundice are, I think, considering the small percentage of mortality, sufficient to justify early operative interference.

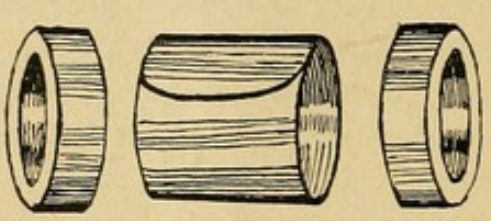
You will find in reviewing the results of these operations that the mortality is greatest in the operation of cholecystenterostomy "in one sitting," by means of suture, in which thirty-five per cent of the cases terminated fatally. The operation showing the next greatest fatality is cholecystendysis, with a mortality of twenty-three per cent. Next high in the scale of mortality is cholecystostomy "in one sitting," the operation which is most prevalent and performed more frequently than any other, and almost as frequently as all the others combined; its mortality is nineteen per cent. This great mortality should cause every thoughtful operator to endeavor to find some other means whereby his patients will not be jeopardized to such a great degree, and while the mortality is nineteen per cent, the percentage of perfect recoveries is only about fifty-one per cent; making the chances for life in the ratio of five to one, and the chances for complete recovery but one to two. Then comes cholecystectomy with a mortality of seventeen per cent. The most favorable of the older operations is cholecystostomy, "in two sittings," in which you have a mortality of ten per cent.

In reference to the criticisms by Prof. Senn, *Jour. Am. Med. Ass'n.*, August 12, 1893, I would say that while he does not comment on the use of the "button" in cholecystenterostomy, some of his criticisms would be applicable to the use of the button in that operation as well as operations on the intestines, therefore, I deem it proper to treat them in this article.

First, he says that "it is no improvement on the rings employed by Denans more than half a century ago." The cor-

rectness of this statement can be readily tested by a cursory comparison of the two devices, (compare figure 2 and figure 6).

Second, he says "that a foreign body is left in the intestinal canal, which may become a source of danger on its way to the distal end of the alimentary canal." Will it become a source of danger, and when? The ileocecal valve is the place in the normal intestinal tract in which it would be most likely, if at all, to produce an obstruction. That this valve in its normal condition allows the passage of bodies much larger in diameter than the button, is shown by the many experiments on that portion of the canal. It is further shown by the clinical observation of medical practitioners, who from time immemorial have seen children swallow coins, nuts, peach stones, marbles and other foreign bodies much larger in proportion to the child's intestine than the button recommended, and pass them without producing unpleasant symptoms. This is considered by doctors to be of so



FIGUKE 6.—Denans' Rings.

little danger that they advise the patient "to pay no attention to it, and forget that such a thing occurred." What surgeon would become alarmed if one of his young patients swallowed a coin or marble? Admit that a coin or marble, under certain pathological conditions, has produced trouble; to the one such case there are thousands that have not.

It will be admitted that with cicatricial contraction of the bowel or a malformation of the ileocecal valve, obstruction might be produced by the button, but the proportion of these cases would be about the same as the proportion of cases of trouble produced by the coin or marble, and so small as to be scarcely worth serious attention.

I have now reports of three hundred (300) operations and experiments with the button. The obstruction so much dwelt upon by the critics of the button did not occur in one of my cases, nor has it "come to my knowledge" that it occurred even once in the cases of others who have performed the operation.

Dr. W. W. Keen in the same paper from which Senn quotes a portion of a sentence referring specifically to the objection, says,

"on the whole, however, I do not feel that this objection is a very serious one, since the condition requiring the use of the buttons, if they be used, is one which must dominate all other risks." (*Annals of Surgery*, June, 1893, p. 660). It can therefore be seen that the danger of obstruction by the button is so slight that it is entitled to no weight in view of the ease with which it is inserted and the certainty with which it fulfils its purposes.

Third. "Any instrument, suture or ligature used in effecting the continuity of a wounded or divided bowel that produces gangrene must be looked upon as a source of danger." The term gangrene is misleading in this connection; the term intended, no doubt, was pressure atrophy. Every suture, every mechanical means that is used, every ligature that is tied in approximating the intestine produces pressure atrophy in a greater or lesser degree, or it gives no support. Shall we discard all these useful measures? Pressure atrophy, "gangrene," (Senn) in vascular tissues is limited to the area of pressure in which the circulation is shut off and is always controlled thereby.

The button above all other methods, suture, rubber rings, bone plates, etc., protects the peritoneal cavity. There is no suture on the peritoneal surface; there is nothing left within the peritoneal cavity; it is shut out and sealed up by a uniform compress. This compress closes as pressure atrophy takes place and closes in the direction of pressing the surfaces desired to be agglutinated, closer and closer together. This is not accomplished by any other device. True there is a substance in the caliber of the intestine, call it foreign if you please; so are the materials used as food to some degree foreign materials, but they, like the button, are on the safe side of the intestine within it, not without.

Fourth. " Because the lumen of the connecting part is not large enough as a temporary outlet for the intestinal contents above the seat of operation." This objection is not tenable. The surgeon well informed on the physiology of the small intestine knows that its contents are always fluid, except in cases where some indigestible solid substance is introduced. Patients are not usually allowed an ostrich diet for a few days following an intestinal anastomosis. No matter what medicine may be given, it does not render the contents of the small intestine solid; they are always fluid. The amount of fluid that would pass through the central opening in a medium sized button in twenty-four hours can be easily computed, and represents many times the weight of the

entire body, while the average amount of feces in the same time is five ounces.

Fifth. The fragment of a sentence quoted by Senn, from Keen's article, is such an inadequate representation of the scientific and fair manner in which this recognized authority treats the subject, that I venture to quote more extensively from it as follows, pages 660, 661: "The speed and certainty with which an anastomosis can be made once the bowel is prepared for it, are certainly advantages which the button possesses over all other means of anastomosis, whether by simple suturing or by bone plates, catgut or other rings." "It is certainly a most happy mechanical invention, especially the method of fastening it by what is practically a secure screw, and yet instead of being rotated in order to fasten it, it simply needs to be pushed home. The two projecting teeth which answer the purpose of the male screw, make it one of the most ingenious devices I have ever seen."

From Keen's postscript I will quote the following, as showing the perfection of the union: "From the outside, one would almost think that it was the normal termination of the ileum in the colon; no more perfect union could be imagined." In regard to the contraction found by Keen in the post-mortem which he reports, we are compelled to admit the force of the suggestion made to me by Dr. W. J. Mayo, that a vital point in the report of that post-mortem is omitted, namely, a comparison of the diameter of the ileum before operation and at the post-mortem. Before operation there was undoubtedly, with a chronic obstruction, distention of the ileum. Did the opening contract more in proportion than the ileum itself, and was not the contraction of the opening due to the contraction of the ileum from its expanded, obstructed, preoperative condition, to its normal, contracted, empty condition produced by a free escape at the anastomosis as found in the post-mortem? An analagous contraction to this is shown in cases in which a cholecystenterostomy is performed experimentally; the opening which was originally the size of the button used is reduced not by the contraction of the cicatrix, but by the contraction of the gall bladder, which after a number of weeks is reduced to the size of a cystic duct. Dr. C. E. Ruth, of Keokuk, in *The Omaha Clinic*, September, 1893, says: "I wish to call especial attention to the specimen in which an approximation was made between the duodenum and the gall bladder. You see that what was a gall bladder has ceased to exist as such, and nothing remains of it but a duct. Its contraction has narrowed the opening which delivered

a five-eighth inch button until it is the size of a slate pencil and shows well marked folds of mucous membrane at its margins that must act as a valve to prevent the passage of intestinal contents into the gall bladder."

A year and four months have elapsed since the first operation of cholecystenterostomy with the button was performed upon the human subject, and the symptoms of obstructive jaundice have not appeared in this nor any of the subsequent cases, as was feared by Dr. Abbé.

The following is a report by Dr. J. Henry Barbot, of San Francisco, of a case in which a post-mortem was made: (*Pacific Medical Journal*, April, 1893). The operation of gastroenterostomy was performed on December 26, 1892. The case was one of carcinoma, involving a large portion of the pyloric end of the stomach. The button used was made from the description given in my paper in *The Medical Record*, December 10, 1892. The patient gained ten pounds in three weeks after the operation. She became so indifferent about her food that she ate beefsteak, potatoes, fish, fried tripe, bananas and other food difficult of digestion. These were all eaten before the button was voided, and still there was no obstruction. She died February 10, forty-six days after operation, of an acute pulmonary infection. The following is the doctor's report of post-mortem: "I examined the stomach and found the opening into the bowel large enough to almost admit two fingers, and the union absolutely perfect." You will note that the length of time that had elapsed between the time of operation and death was only one day less than in Keen's case, still the opening remained almost large enough to admit two fingers.

Dr. C. E. Ruth, *Omaha Medical Clinic*, September, 1893, comments as follows: "This not only simplifies, but gives an element of certainty in this formerly impracticable operation, that is scarcely believed until seen. Its importance can scarcely be overestimated. The operation has been done successfully on eight persons. You will notice that no such contraction occurred in any of the specimens as that which occurred between the gall bladder and duodenum; in fact none whatever. I have done gastroduodenostomy, cholecystenterostomy, lateral and end to end approximations, specimens from all of which I now show you, and in no case did I fail to get firm union without a fistula or a particle of fecal or gaseous extravasation."

Dr. F. Andrews, of Chicago, in *Omaha Clinic*, September, 1893, says: "It is the means par excellence for establishing a gastric or

fecal fistula. By having a string attached, as soon as pressure atrophy has released the button, it is at once drawn out of the wound, without being allowed to pass through the intestinal tract."

Dr. McFadden Gaston, referring to the button, in *Southern Medical Recorder*, July, 1893, writes: "This device * * * for uniting different structures has now been tested in a sufficient number of cases to afford a reasonable reliance upon its efficacy. The results were entirely satisfactory in the demonstration of the adaptation of the button for anastomosis, and there can remain but little doubt of a communication with surrounding adhesion being accomplished by it, with more expedition than by processes heretofore adopted."

Dr. Hugh Ferguson, Winnepeg, used the button for a case of pylorectomy with end approximation of duodenum to side of stomach, also in a case of cholecystenterostomy, both successful. In a personal letter he writes as follows: "I am more than pleased with the anastomosis button. It is really more than an anastomosis button and should be designated 'Murphy's Intestinal Button.' If a discussion on the button arises at the Pan-American Meeting you may quote these two cases. The button cannot be too soon known."

Dr. W. B. Rogers, Memphis, Tenn., July 30, 1893, writes: "I would say that immediately on my return here I had an opportunity for using your button for the operation of cholecystenterostomy and it worked like a charm."

Dr. R. F. Weir, of New York, writes: "I have used the 'button' for cholecystenterostomy and like its ease of application, though the fatal ending prevented the fullest test being made. The result however was not due to the method but to the case itself, which was neoplasm compressing common duct and engaging both liver and pancreas."

Dr. J. Henry Barbot, (*Pacific Medical Journal*, April, 1893), who used the button in performing a gastroenterostomy, comments as follows: "An anastomosis may be done by this method with perfect safety and with a result that cannot be obtained by any other method. The day of bone plates, catgut rings and numerous other devices, that have been used in performing the anastomosis operations, is past and every surgeon should provide himself with a set of the buttons which does not require an extensive amount of operative skill to use."

In a recent communication Dr. Willy Meyer, of New York, favored me with a report of two successful operations with the

anastomosis button and commented as follows: "In both cases your button worked like a charm, impressing me and everybody present, that, in your ingenious device, we have entered a new era of modern intestinal and gall bladder surgery."

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No.	Date.	Publication.	Operator.	Diagnosis.	Operation.	Method.	Result. Recov.	Result. Death.	Result. Cause of Death.	Remarks.
1	July 4, '87	Medical News, June 11, '92.	Monastyrski.	Carcinoma head of pancreas.	Cholecystojejunostomy.	Suture.	1			Death 4 months later.
2	" 6, '87	Gaillard's Med. Jour. Aug. '92.	Kappeler.	Tumor pancreas.	Cholecystoileostomy.	" Wolfler.	1			Death 15 months later.
3	Nov.19 '87	Correspbl. f Schweiz. Artze 4, '89.	Socin.	Carcinoma pancreas.	Cholecystenterostomy.	"	1			
4	Apr.24,'88	Correspbl. f. Schweiz Artze 6. '90	Fritzche.	" common duct.	Cholecystojejunostomy.	Elastic ligature		1		
5	" 24,'88	Centbl. f. Chir. 12, '89	Badenheuer.		Cholecystenterostomy.	" "		1		
6	" 24,'88	" " " "	"		" " "	" "		1		
7	Mar. 2,'89	Med. Chir. Trans. '90	Robson.	Closure biliary fistula after cholecystotomy.	Cholecystocolostomy.	Suture.	1			
8	Aug.13,'89	Rev. de Chir., '92.	Terrier.	Occlusion, common duct.	Cholecystoduodenostomy.	Suture & drain tube.	1			Death 1 year later. Influenza.
9	Mar. 28'90	Path. and Chir. d. Gallenwege, '90.	Courvoisier.	Complications following cholecystotomy.	Cholecystenterostomy.	Suture.	1			
10	Sept.29'90	Sammlung Klin. Vortrage, 40, '92.	Korte.	Cholelithiasis obstruction.	Cholecystoduodenostomy.	"		1	After 7 days. Collapse.	Second operation, October 3.
11	Jan. 14,'91	Berlin Klin. Woch., 12, '92.	Lindner.	Closure biliary fistula.	Cholecystenterostomy.	"	1			
12	" 16,'91	Deutsche Med.Woch. 9-3, '91.	Sprengel.	Cholelithiasis.	Choledochoduodenostomy.	"	1			
13	May21,'91	Samml. Klin. Vort., 12, '92.	Korte.	" obstruction.	Cholecystoduodenostomy.	"	1			
14	Oct. 24,'91	Lancet March 12, '92.	Chavasse.	Closure biliary fistula after cholecystotomy.	Cholecystocolostomy.	Bone plates.	1			
15	Nov. 2, '91	Berlin Klin. Woch., 12, 92.	Lindner.	Closure biliary fistula after cholecystotomy.	Cholecystenterostomy.	Suture.	1			
16	Nov.16 '91	Deutsche Med.Woch. Feb, 25, '92.	Helferich.	Closure biliary fistula after cholecystotomy.	Cholecystojejunostomy.	"	1			
17	Aug.13,'92	Bull. et mem. Soc. de Chir., '93.	Reclus.	Cancer of pancreas, probable.	Cholecystenterostomy.	"	1			
18	" 28,'92	Wien. Klin. Woch., Jan. 19, '93.	Frankel.	Closure biliary fistula.	Cholecystenterostomy.	"		1	After 10 hours.	
19	Sept.21'92	Wien. Klin. Woch., May 11, '93.	Gersuny.	Cholelithiasis obstruction.	Cholecystogastrostomy.	"	1			
20	" 21,'92	Band III. Klin. Chir., IX., p. 2, '92.	Czerny.	Closure biliary fistula after cholecystotomy.	Cholecystenterostomy.	"		1	Exhaustion.	
21	" — '92	Band III. Klin. Chir., IX., p. 2, '92.	"	Occlusion.	Cholecystocolostomy.	"		1	2 weeks hæmorrhage.	Temporary recovery.
22	" — '92	Band III. Klin. Chir., IX., p. 2. '92.	"	" tumor.	Cholecystoduodenostomy.	"	1			
23	Jan. '93	Boston Med. & Surg. Jour., March 23, '93.	Jones.		Cholecystenterostomy.	"	1			
24	Feb. 1, '93	Amer. Gynec. Jour. June '93.	Ross.		Cholecystoduodenostomy.	Elastic ligature		1	37 days, continuous hæmorrhage.	

CHOLECYSTENTEROSTOMY.

No.	Date.	Publication.	Operator.	Diagnosis.	Operation.	Method.	Result. Recov	Result. Death	Cause of Death.	Remarks.
1	June 11,92	N.Y.Med.Rec.Jan.13,'94	Murphy.	Cholelithiasis.	Cholecystoduodenostomy.	Murphy button.	1			
2	Oct. 19,'92	" " " " "	"	"	" "	" "	1			
3	Nov.23, 92	" " " " "	"	"	" "	" "	1			
4	Dec.18,'92	" " " " "	"	"	" "	" "	1			
5	Jan.31, '93	" " " " "	Murphy.	"	" "	" "	1			
6	Feb.20,'93	" " " " "	Lee.	"	" "	" "	1			
7	Apr. 6, '93	Jour. Am. Med. Assoc., Aug. 26, '93.	Mayo.	Obstruction of common duct.	" "	" "	1			Patient 71 years old.
8	Apr. 28, 93	Medical Arena, Kansas City.	Foster, W. D.	Gall bladder fistula, obstruction of choledochus.	" "	" "	1			Fistula closed without operation.
9	May 6, '93	N.Y.Med.Rec.Jan.13.'94	Murphy.	Cholelithiasis, occlusion common duct.	" "	" "	1			
10	" 22, '93	" " " " "	"	Cholecystitis, impaction.	" "	" "	1			
11	June 1, '93	" " " " "	Fabrique.	Hepatic colic, "	" "	" "	1			
12	" 1, '93	" " " " "	Rogers.	Closure biliary fistula after cholecystotomy.	" "	" "	1			
13	July 18,'93	" " " " "	Hartmann.	Cholelithiasis.	" "	" "	1			10th day removed button through fistula.
14	Aug. 3, '93	" " " " "	Ferguson.	Dropsy, gall bladder.	" "	" "	1			
15	Sept20,'93	" " " " "	Lane.	Cholelithiasis.	" "	" "	1			
16	Oct. 20,'93	" " " " "	Luken.	Cholelithiasis, obstruction common duct.	" "	" "	1			
17	" 26,'93	" " " " "	Hartmann.	Cholelithiasis, obstruction cystic duct.	" "	" "	1			
18	Nov. 7,'93	" " " " "	Murphy.	"	" "	" "	1			
19	Jan. 6, '94	Unpublished.	Dunn.	" obstruction common duct.	" "	" "	1			Button passed 18th day with 26 stones.
20	Feb.13,'94	Unpublished.	Murphy.	Cholelithiasis.	" "	" "	1			Two ¾ inch stones removed.
1	March '93	N.Y.Med.Rec.Jan.13,'93	Wier.	Cancer of pancreas liver omentum and gall ducts.	Cholecystenterostomy.	" "		1	Exhaustion. Perfect approximat'n.	
2	May '93	" " " " "	Murphy.	Cancer of duodenum, gall ducts, liver.	Cholecystojejunostomy.	" "		1	4 days, ileus. from volvulus, loop of jejunum twisted upon itself.	