

POSTOPERATIVE ACUTE DILATATION OF THE STOMACH.

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THIS is a condition, a complication, and not a disease. I have endeavored to exhaust the literature on the subject, published since the article of Loffer, appearing in the early part of 1908, in which he gives the findings or conclusions based on 217 cases reported up to that time. These recent articles are sixty-eight in number, closing with June of this year, and have been contributed by both American and European authors.

I am sorry that time would not permit me to make any personal experiments to verify the truth or prove the falsity of the claims and conclusions gathered from these observers. I sincerely trust that the title and body of this paper shall not lull the conscience of any physician to a sense of individual security in the thought that acute dilatation of the stomach alone concerns the surgeon, and is only a postoperative condition. It is not only *not* a rare condition, but it is probably quite as frequently met with by the general practitioner as by the surgeon, and it may be encountered as a complication often far more grave than the original malady, in all forms of injuries, after nervous shock of various kinds, in all acute infections, prolonged and debilitating diseases, as well as acute indigestion, and may occur at any age and without sex preference. It has been known to follow operations after all kinds of general, spinal and local anesthesia, and following operations in which the stomach had been thoroughly irrigated.

History.—Rockitansky described the condition in 1842. He thought it was due to duodenal compression by the mesenteric root. Brinton recognized it in 1859 and believed it due to paralysis.

Etiology.—Certain conditions, recognized postmortem, have been proposed as undoubted causes of this condition. So varied and contradictory or inconstant have been some of these that most authorities have been forced to the conclusion that not one

constant but many possible factors may operate and present varying degrees of importance in different cases. It is certain that paralysis of any part of the intestinal tract is promptly followed by rapid dilatation of that section, and that no demonstrable obstruction is needed at either end of the paralyzed section to prevent the accumulation of gas or fluid from escaping. It seems equally true that paralysis of the stomach and part of the duodenum will also in many cases lead to rapid dilatation of the stomach, at times even to the point of rupture, without there being any point of obstruction more than would exist from the normal power of the sphincter-like tonicity of the circular fibers of the pylorus and cardia, plus that which naturally results from the orificial displacement due to the dilatation. With the dog or cat under profound anesthesia the stomach may be distended until the respirations grow labored, heart feeble and rapid, and dissolution appears imminent; rupture of the stomach occurs or death takes place. But if either the stomach of the dog or cat is unduly distended, when narcosis is not profound, the animal relieves itself by emptying the stomach, and every experienced anesthetist has noted the tendency of a loaded stomach to empty itself under partial anesthesia, but he has also noticed that all vomiting is at once stopped when profound narcosis is attained and no vomiting can again occur until the individual has partly, at least, recovered from the anesthetic. In fact, the anesthetist can have no surer sign that his patient is passing from under the anesthetic, or that he has not been under it completely, than when there is retching or vomiting. These facts prove very conclusively, either that the stomach is paralyzed by the anesthetic, that the vomiting center is paralyzed, or that reflex inhibitory influence has resulted in muscular paresis, and this again at once paves the way for fermentive activity and gas formation from food or other gastric contents, bacterial toxic invasion of the tissues and rapid distention of the stomach which may easily get under considerable headway during a protracted operative procedure. Within a few moments or hours under favorable conditions, such a quantity of gas or fluid may accumulate in the stomach as to distend the stomach and displace all the intestines downward, while the stomach occupies the entire abdomen, interferes with the heart's action by upward pressure and may produce rapid death or grave symptoms without any real obstruction either at the cardia, pylorus, or in the upper intestinal tract.

When moderate distention of the stomach takes place the displacement may so press the root of the mesentery where it crosses the third part of the duodenum, as to completely stop all egress downward of gas or fluid so that pancreatic, duodenal and biliary secretions after distending the duodenum are poured from this overdistended organ through the pylorus into the stomach. These secretions are decidedly irritant and even corrosive to the gastric mucosa, and reinforced by the irritating properties of the anesthesia, now also being eliminated by way of the stomach, a powerful exosmosis sets in which in some cases rapidly drains all the available fluids from the body into the stomach. Regurgitation usually occurs rather than real active vomiting, for it is brought up in mouthfuls, often without effort, and without nausea in some cases, and practically always free from feculant odor. The stomach losses in this way are often much like the overdistended and parietic urinary bladder overflow and is well expressed by the term regurgitated rather than vomited. To these possible etiological factors which may act to cause acute dilatation must be added all debilitating, and toxic agents of the septic infection type as well as those of ordinary narcotic influences, among which latter the anesthetic must not be ignored. The following sequence must then present itself in cases of this class:

1. Paresis of the stomach, vomiting center or inhibition through nerve connection.
2. Dilatation.
3. Increased obstruction at the cardia and pylorus as well as through traction upon, and angulation of, the stomach orifices and compression at the duodenal mesenteric crossing.
4. Peristalsis will also be found entirely absent in nearly every case.

Mac Evitt says the stomachs of dogs can be distended to bursting during anesthesia, but not otherwise.

Fairchild says that whatever may cause paresis may cause dilatation of the stomach. He also gives the three principal causes, namely,

1. Toxic (neuro-paralytic).
2. Gastro-mesenteric ileus.
3. Peritonitis.

Symptoms.—Vomiting, usually of the regurgitant type, thirst, inordinate and uncontrollable, moderate pain in some cases, sensation of fullness in the epigastrium, temperature usually

but slightly elevated and at times normal. Inspection shows distention of the upper abdomen, slight or no evidence of peristalsis, tympany often very extensive and may in the dorsal decubitus extend over the entire abdomen with slight dulness noted only when percussion is made low laterally with the patient turned on the side. Splashing can be noted readily in some of the cases. In rapid distention grave disturbance is quickly noted in restlessness, dyspnea, rapid pulse becoming feeble and thready, urine very scant—the urine is so small in amount as to cause at times error in diagnosis under the supposition that the patient is dying from suppression, with uremia. The amount of fluid poured into the stomach and regurgitated is at times enormous and far in excess of the amount ingested. The vomited fluids are dark greenish, brown or almost black, sour smelling but not feculent, although presenting some fermentative odor. Constipation is the rule and in some cases collapse comes early and is profound.

Diagnosis.—Diagnosis is always easy to one who is on the lookout for the condition and will make careful examination of the case. Persistent vomiting of the regurgitant type especially coming on after the anesthetic nausea is past and in the absence of severe local pain, rigidity of the abdominal walls or local tenderness, especially when accompanied by marked distention of the upper abdomen, becoming general with intense thirst, great prostration, rapid pulse, often without evidence of peritonitis or marked rise of temperature and accompanied by progressively increasing dyspnea, is almost an unmistakable complexus of indications of acute dilatation of the stomach. Passing a stomach tube will at once prove or disprove the diagnosis by drawing off the accumulation of gas and fluid, following which if the stomach be washed until the fluid returns clear, relief of all the symptoms subjective and objective renders the diagnosis certain.

Pathology.—The postmortem findings are so inconstant and variable that one may say that it has no pathology except that of dilatation of the stomach. The dilatation varies from a moderate degree, extending to or beyond the umbilicus, to complete filling of the abdomen and collapsing of the other hollow viscera, or displacing the small intestines into the pelvis. Accompanying this extreme distention, there will frequently be encountered yielding of the muscular coat in different places, various changes in the mucosa and a decidedly anemic state of the

stomach as a whole. The distention of the stomach has in probably 20 per cent. of the postmortem cases extended into the duodenum to the point where the superior mesenteric artery crosses the third part of the duodenum on the anterior surface of the body of the second lumbar vertebra. This postmortem findings caused some observers to conclude that the mesenteric root crossing the duodenum was the primary cause of the obstruction and the dilatation of the stomach, when really obstruction at this point never could or would have occurred save by strong traction on the mesentery or direct pressure of the dilated stomach until the resistance to the passage of gas and fluid was greater at this point than at the pylorus. Undoubtedly stasis in both the stomach and duodenum favors bacterial invasion. All experience and experimental work proves that when any part of the intestinal tract is paralyzed, distention of the part is rapid, tissue bacterial invasion probable and angulation quickly prevents the passage of gas from the distended into the healthy part. The stomach behaves exactly the same way save that obstruction by angulation is not so complete or easy, though it is entirely sufficient in many cases at both the pylorus and cardia to prevent the passage of gas on account of the sphincter-like action of the circular muscular fibers at both orifices until the tension is so great that the pylorus yields in 20 per cent. of the cases. The cardiac orifice also permits the passage of some gas or a mouthful of dark brown or greenish fluid and at times a very large amount may be so expelled. When the dilatation succeeds in forcing the pylorus, then the gastric and pyloric contents will mingle to the point where the mesentery crosses the duodenum. The distention will not be likely to pass this line because the duodenum is normally flattened out on the anterior surface of the body of the second lumbar vertebra, the mesenteric root crossing the front of the gut with its sharp edge pressed firmly against the intestine, and held there by the new enormously distended stomach, into which is constantly being poured the outward osmotic flow from the body fluids. The fermentive changes manufacture more and more gas which in turn increases the stomach distention and the force with which the small intestines are pressed downward lower and lower into the abdomen or pelvis, pressing the root of the mesentery directly and by traction against the duodenum. The duodenum cannot yield posteriorly because of its contact with the spinal

column, besides every particle of additional distention of the stomach also increases the direct stomach pressure against this same point, making egress of gas or fluids by this route an impossibility unless the stomach can be lifted forward to relieve tension on the transverse duodenum and the root of the mesentery. It has been proven by experiment that in these cases where distention produced obstruction at the mesentery crossing, as soon as the finger was passed behind the stomach and it was lifted forward so as to remove the direct stomach pressure on the duodenum, if the mesentery was not being forcibly drawn downward, the duodenal and stomach contents rapidly drain through into the small intestines. These incontrovertible facts prove conclusively to my mind that as a primary causative and obstructive factor in acute dilatation of the stomach, the crossing of the root of the mesentery over the transverse part of the duodenum must be abandoned. How much of the pathology noted postmortem in the gastric mucosa is due to fermentation, irritation and corrosive action of the pancreatic juice entering the stomach can as yet be only conjectured. The distention is at times entirely gaseous and on passing the stomach tube gas and fluid is occasionally expelled with almost explosive force. The stomach being distended must yield at points of least resistance. The lesser curvature is short and its extremities more or less fixed by the cardia and pylorus with the resisting hepatic and diaphragmatic dome limiting displacement upward, so that as the dilatation continues the greater curvature is finally pressed against the abdominal walls at all points, while the lesser curvature is folded as it were, or more properly angulated as some observers have noted it, in the form of a "V" or "U." The folding together of the lesser curvature aids in traction upon and semiobstruction of both the cardiac and pyloric orifices. The contents of the stomach, while mostly gas, have been known at times to consist of two gallons of fluid. Liver, gall-bladder, pyloric and other adhesions as well as drainage tube or gauze pressure or drainage reflex irritation has seemed to be the principle pathology responsible for the manifestation in some cases.

Miller says "The hypersecretion from the stomach may be an effort of nature to eliminate poisons usually removed by the kidneys and liver or terminal manifestations of a grave toxemia."

Certain it is that by whatever means the bile and pancreatic juices gain access to the stomach, they at once begin an irri-

tating and even corrosive action and possibly their presence in the stomach may powerfully stimulate the osmotic flow in all cases in which the stomach is incompletely emptied by vomiting.

The fluid itself poured into the stomach from the general system may by dilution greatly lessen this irritant and corrosive action and aid in emptying the stomach by emesis or in other words be simply another instance of nature's conservative effort in prolonging fight for life while it gives to us at the same time a very important therapeutic hint in gastric lavage.

Prognosis.—The mortality has been variously estimated at from 40 to 80 per cent. There is little question but that the early diagnosis and prompt use of the best recognized treatment will give a greatly reduced mortality. The very severe cases will sometimes die within a few moments to five hours, while the less severe may linger from ten to twelve days. From whatever cause extreme dilatation of a viscus occurs, there must result more or less paresis for some time thereafter and this should forewarn us to not permit extreme redistention for fear that the paresis of distention may itself cause permanent loss of tone. This is doubly important in cases of the class under consideration where paresis undoubtedly played the most important rôle in the development of the trouble. It would therefore appear that in early emptying of the stomach and preventing its refilling there would be presented the first prognostic indication. The cases which present a high temperature from the start will give the greatest fatality because the septic intoxication which produced the pyrexia has also caused the paresis which in turn caused the acute dilatation of the stomach and the removal of the stomach contents may not be able to even slightly influence the septic process which was the primary cause. Those cases, on the other hand, which have a slight temperature rise or none until the dilatation of the stomach is very pronounced, may have had the paresis produced by a nervous shock, a blow on the epigastrium, fracture of the spine, paresis of the pneumogastric or its ganglionic center, reflex irritation from operative trauma to the solar plexus or be produced by pressure from drainage. Elimination by the stomach mucosa of ether or other toxic agents may cause or aid in causing the local manifestations, to say nothing of the almost unlimited number of debilitating causes, including indigestion from dietetic indiscretions. It will at once appear that the ability to recognize the cause and promptly to remove the same will have much

to do with determining the prognosis and also that statistics are quite misleading because of the variety of factors entering into the different cases.

Treatment.—Should consist first of prevention to the utmost of our ability, by the suitable preparation of the patient. The stomach and intestinal tract should be as free as possible from undigested food stuff which might by arrest of the digestive process, undergo fermentation or decomposition and cause considerable quantities of gas or produce toxemia. It is necessary to avoid too profound and prolonged anesthesia. The utmost care must be taken to minimize operative trauma and pressure or adhesive irritation to the solar plexus from drains used in the upper abdomen. Frequent change must be made in the patient's position to one side or the other, to facilitate the passage of gas or liquids and at the same time the danger of slight gastric distention will be reduced, thus preventing the stomach from impinging upon the mesenteric root and interfering with ready passage of gas and fluids into the jejunum and possibly cause regurgitation into the stomach. The operation must be completed in the shortest possible time to reduce to the minimum the period during which the vomiting center (safety valve function) is paralyzed by the anesthetic. Exposure of the abdominal viscera must be as slight as possible. Especially dangerous is much handling, air contact and friction of all kinds, but particularly wiping the abdominal viscera with gauze. *Avoid all contact of dry gauze* with the endothelial surface of any viscera. Use only gauze in the abdomen which is wrung fresh from hot normal salt solution and placed in contact with the abdominal viscera in the gentlest possible manner. The omentum must be used unsparingly to prevent the formation of dangerous intestinal adhesions, by securing it in contact with and to cover all dangerous surfaces but always without traction, and as a graft when necessary. The utmost care must be exercised to prevent the patient from taking too much and unsuitable food for some days after an operation, because many persons have little or no digestive power for several days after taking an anesthetic. The active therapeutic indications are immediate emptying of the stomach by the tube followed by lavage until the fluid returns clear and this must be done as soon as there is stomach distention, tympanitic or dull, with or without pain, nausea, vomiting, regurgitation of fluid or belching of gas and without waiting for the pulse to be greatly increased in frequency

and lessened in force, respiration embarrassed, cynosis to be extreme or the thirst to be of the agonizing, torturing kind. This use of the tube and lavage is to be repeated as often as there is the slightest manifestation of the return of distention in the upper abdomen before any symptoms take place, because an organ recently distended and paralyzed from whatever cause, cannot recover its tone if allowed to become redistended soon, for distention frequently repeated or even once of sufficiently severe a type, may render paralysis permanent without any other associated condition. The permanent loss of contractile power from overdistention of the urinary bladder is well known and there does not seem to be any good reason to consider the stomach an exception. The stomach tube therefore may be needed every thirty minutes to six or eight hours.

I am sure that we erred in our first case in not passing the tube several times instead of once and by allowing ourselves to be lulled to a sense of security by the slight discomfort of which the patient complained; slight distention, absence of vomiting and ease with which she expelled and eructated gas. The grave condition of these patients of itself bars out of consideration the undertaking of such operative procedures as sectioning the duodenum and reuniting it in front of the root of the mesentery (F. Byron Robinson), gastrojejunostomy, gastrotomy, etc., even though they offered any prospect of benefit more than the use of the tube, which they do not. For the condition has occurred in cases in which gastrojejunostomy had previously been done and only one case in about every five presents obstructions of any part of the duodenum. It is very doubtful if the obstruction noted in any of the 20 per cent. of cases had anything to do with the production of the condition, but the evidence is almost indisputable that in this percentage in which the obstruction was noted, it was a result of the dilatation and in no sense a cause. Hence, though these operative procedures represented no gravity, they would still be a waste of time and absurd therapeutic measures. Normal salt, hypodermoclysis or continuous drop method enemata to replace the fluids lost by the rapid osmotic outflow through the stomach, are imperative in most cases. Hypodermoclysis must be used in all cases in which there is also inability to retain enemas or in which there exists diarrhea or frequent passages of gas per rectum, as occurs in some of these cases. The terrific thirst is one of the most urgent indications for the use of hypodermoclysis or proctolysis to

relieve the starving tissues. The mechanical interferences with the heart and respiratory functions is at times very great and the stomach tube gives the only sure, safe and instantaneous relief to both. The fact that death may be almost instantaneous or occur after two weeks, only emphasizes the need of promptness and thoroughness in the use of the tube. Whether any benefit may be obtained from the use of acids, alkalies or antiseptics will depend upon the condition of the fluids drawn by the tube at the time of the lavage. About the only operative condition which could be considered justifiable under these conditions would seem to be the removal of drains, particularly those in the upper abdomen where they may cause pressure, obstruction or splanchnic reflex inhibition, or for the release of adhesive obstruction. The position treatment so insisted upon (Geo. R. Fowler), probably represents more preventative than curative influence, for when the stomach has already undergone great acute dilatation the prone position is impossible and the lateral decubitus is not able to release the defective drainage points. The value of placing patients on the side early after all operations, particularly the right side, to facilitate drainage through the pylorus, and to prevent dilatation and pressure obstruction upon the root of the mesentery, cannot be questioned and by turning our patients we will do much to lessen the irksomeness and lumbar pain of the first few postoperative days. In cases with falling temperature, artificial heat must be freely applied. After the use of the stomach tube the patient may often lie on the face comfortably and empty the stomach as it fills, without difficulty, and he should not be permitted to resume the dorsal decubitus. The Trendelenburg position would seem to favor rather than overcome reversed peristalsis and the same is true of the knee and chest position though the latter, like the prone position, is impossible with many of these cases.

The use of strychnin, heroin, eserine or other drugs should be to meet the symptomatic manifestations as they arise in each individual case and according to the judgment of the physician.

CONCLUSIONS.

First, failure of the cardiac orifice to readily yield is the one essential to acute dilatation of the stomach.

Second, motor paralysis of the stomach, whether due to cen-

tral or peripheral paresis, to inhibition through the solar plexus and splanchnic stimulation, or any narcotic or toxic agent, may cause the condition.

Third, reflex inhibitory influence is well shown by failure to produce dilatation of the stomach from ligating the duodenum alone, but to ligate the duodenum and crush the testicle in dogs promptly causes dilatation of the stomach.

Fourth, the greater frequency of the condition following surgery of the upper abdomen, in which wick and other drains are used, indicates the importance of inhibitory influences of the solar plexus, trauma and irritation.

Fifth, knowing that paralyzed bowel is obstructed bowel and peristalsis can alone obliterate kinks due to paralysis, we should not expect the stomach to be subject to different laws.

Sixth, on whatever side of the cardia the gastric muscularis is weakest, the dilatation will be greatest, causing the cardiac opening to be pushed to the opposite side and more or less angulated against the sharp margin of the cardiac opening in the diaphragm, thus adding another factor of difficulty in emptying the stomach by vomiting.

Seventh, operative absurdity is at once indicated by the impossibility of draining a paralyzed stomach into a paralyzed gut, and a considerable part of the intestinal tract may be expected to be paralyzed in every case of acute dilatation of the stomach by the same cause which produced the gastric paresis and paved the way for dilatation.

Eighth, the permanency of acute dilatation of the stomach will depend upon the cause operating to produce the paresis and upon the degree of distention.

Ninth, acute dilatation of the stomach sometimes occurs and progresses rapidly during an operation.

Tenth, as only a few drops of ether in the stomach may cause great dilatation, it is necessary to prevent the patient from swallowing ether.

Eleventh, acute dilatation of the stomach may begin when the small intestines are very much distended with gas and not yet parietic.

Twelfth, occlusion by the root of the mesentery must be secondary else the tube and lavage would not afford relief. The need of vigilance must not be relaxed in any period of life as the condition has been encountered at nine months and at seventy-four years of age. In all cases the stomach tube must be at once

passed as it represents no danger and its early and thorough use gives almost the only hope of cure.

Thirteenth, it is so easy to detect the first manifestations of acute dilatation of the stomach by touch that I am convinced that at every visit for the first few days after an operation the surgeon should pass the hand down over the ensiform cartilage and note whether there is distention of the epigastrium and when it is detected he should pass the stomach tube at once and prevent grave complications. This precaution is especially important in abdominal cases and interns as well as nurses should be taught the importance of this sign of fullness in the epigastrium in order that danger from acute dilatation of the stomach may be at once detected and dealt with in time, even though the surgeon may not be present, because of the extreme rapidity with which it may develop into a condition of the utmost gravity.

The average age of the patients reported in this list is thirty-seven years, the oldest being seventy-one and the youngest two and one-half. The report includes the work of forty-two operators, eight cases being the greatest number reported by one operator. The two cases reported by the author were encountered within the last year. The sex was given in eighty-five of these cases, with twenty-six males and fifty-nine females. The anesthetic used is mentioned forty-one times and in the following number: Ether, twenty-seven; chloroform, seven; scopolamin-morphin-ether, two; ether and chloroform, two; hyosin-morphin-chloroform, one; nitrous oxide, one; gas and oxygen, one. This includes nine gastroenterostomies and twelve appendectomies. The justifiability of undertaking to cure acute dilatation of the stomach by gastroenterostomy and the obstructive influence of the root of the mesentery as a causative factor in producing acute dilatation of the stomach is nevertheless emphatically denied because in every case the gastrointestinal anastomosis was made beyond the mesenteric root crossing of the duodenum. The operative time is given in only twenty-two these cases and it slightly exceeds one hour.

It would be interesting to know what was the operative time on many of these other cases because of its undoubted influence in the production of acute dilatation of the stomach. In twenty-two cases the symptoms of acute dilatation of the stomach were manifested within twenty-four hours after operation, in forty-one the first symptoms appeared from the fourth to the sixth day and in one case the onset was delayed to the

sixth week. In cases so long delayed in their onset as six weeks, one must always look for a cause, as dietic error, nearer in time to the manifestation than that of the operation.

In this list there were sixty-one recoveries and thirty-nine deaths, or a mortality of thirty-nine per cent. In sixty-seven of these cases the stomach tube was used, usually accompanied by lavage. Of the sixty-seven thus treated, there were forty-seven recoveries and twenty deaths, or a mortality of a little over 29 per cent. If we exclude from this last list, eight cases in which the acute dilatation was complicated, in some by general peritonitis, septicemia, erysipelas (the latter given as the cause of death in one case) and one case in which the operator admitted the probability that acute dilatation of the stomach existed at the time of operation, the mortality of those cases of uncomplicated acute dilatation treated by the passage of the stomach tube, is reduced to less than 18 per cent.

We have reason to believe that this mortality will be still farther reduced when the diagnosis is made earlier and the stomach tube and lavage are persistently and intelligently used.

The eleven cases reported by Boice, Littig, Osborne and Ruth, have not been previously reported or published.

Three of the reported cases should have been excluded as not strictly deserving a place in an article on postoperative acute dilatation of the stomach, but I have allowed them to remain because they contained important suggestions or data. Hendon mentions having had three other cases which he did not report. These would bring the entire number up to 100, after excluding the three cases not properly belonging in this series. Hendon's unreported cases, however, would still further reduce the percentage of mortality because all three of his unreported cases recovered.

CASE REPORTS ON ACUTE DILATATION OF STOMACH.

Name of operator	Age of patient	Sex	Anes- thetic	Operation	Time of opera- tion	When symptoms appeared	Treatment	Results and remarks
(1) Axhausen.....	41	Male...	.....	Posterior gastrojeju- nostomy.	.....	11th day.....	Four days later (15th day) relaparotomy was done and the adhesive obstruction which was present was re- moved. The distal con- tracted intestine at once filled.	Recovery prompt and com- plete. Gained 5 lb. in 3 weeks.
(2) Axhausen.....	41	Male...	.....	Gastroenterostomy ..	.....	11th day.....	Five days later (16th day) relaparotomy was done. Found a tubercular stenosis of duodenum. Excision of stenosed portion of gut was done.	Convalescence disturbed for 10 days following operation by local perit- onitis. Condition cleared up with recovery.
(3) Barker.....	40	Female..	.....	Posterior gastrojeju- nostomy for duo- denal ulcer.	.....	1st day.....	Stomach tube every 3 to 5 hours—12 quarts of liquid and much gas removed in 16 hours—Prone position used.	Improvement for 5 days. Death on 18th day, due to peritonitis.
(4) Barker.....	40	Female..	.....	Appendectomy; pos- terior gastrojejunos- tomy.	.....	10th day.....	Repeated lavage.....	Died on 17th day.
(5) Blain.....	57	Female..	Ether...	Exploratory lapar- otomy.	.....	3d day.....	Stomach tube passed 14 times in 24 hours.	Recovery in 15 days.
(6) Blain.....	29	Male...	Ether..	Appendectomy.....	30 min.	2d day.....	Lavage of stomach done 11 times.	Recovery in 15 days.
(7) Blain.....	.....	Male...	.....	Appendectomy.....	.....	3d day.....	Lavage was repeated several times.	Prompt recovery.
(8) Blain.....	.....	.....	.....	Epidural tumor of the lumbar cord.	.....	6th week.....	Tube and lavage used for 10 days.	Recovery.
(9) Blain.....	34	Female	Ether ..	Salpingectomy.....	.....	3d day.....	Stomach tube drew 2 quarts of bile-colored fluid.	Recovery without further trouble.

CASE REPORTS ON ACUTE DILATATION OF STOMACH.—CONTINUED.

Name of operator	Age of patient	Sex	Anes- thetic	Operation	Time of opera- tion	When symptoms appeared	Treatment	Results and remarks
(10) Blain.....	.....	Female..	.....	Inversion of the ap- pendix; and ovari- otomy.	.....	6th day.....	Tube drew 2 quarts of brown fluid.	Died on 13th day.
(11) Blain.....	.....	Female..	.....	Ovariectomy for cyst..	.....	3d day.....	Lavage repeated 3 times....	Recovery in 12 days.
(12) Blain.....	28	Female..	.....	Alexander operation on the round liga- ments.	.....	5th day.....	Lavage was done 5th and 6th days.	Recovery.
(13) Boice (C. A.)*	58	Female..	Ether ..	Abdominal hysterec- tomy.	100 min.	3d day.....	Lavage gave immediate re- lief.	Death in 18 hours from onset of symptoms—no autopsy.
(14) Boyd.....	.....	Female..	.....	Induced abortion for pernicious vomiting.	.....	6 hours.....	.....	Died in 10 hours.
(15) Boyd.....	.....	Female..	.....	Perinephritic abscess.	.....	2d day.....	.....	Died in 24 hours.
(16) Boyd.....	25	Male alcoholic	Chloro- form.	Inguinal adenitis....	.....	3 hours.....	Tube was passed the 3d day..	Died. (Diagnosis was made only a few moments before death—at which time stomach tube was passed.)
(17) Boyd.....	2 1/2	Female..	.....	Ill two days with re- gurgitant vomiting.	.....	.....	Repeated lavage.....	Death occurred on 8th day.
(18) Boyd.....	38	Male....	Chloro- form.	Cut in a brawl .....	.....	17 hours.....	.....	Died in 48 hours. Stomach was distended with fluid and gas. Pyloric kink present.
(19) Callender.....	.....	Female..	Ether ..	Salpingoophorec- tomy.	45 min ..	36 hours.....	Repeated lavage.....	Death occurred. Post- mortem findings showed a general peritonitis and extensive adhesions to the stomach. Pulse at- tained a rapidity of 160 within 36 hours.

CASE REPORTS ON ACUTE DILATION OF STOMACH.—CONTINUED.

Name of operator	Age of patient	Sex	Anes- thetic	Operation	Time of opera- tion	When symptoms appeared	Treatment	Results and remarks
(20) Callender....	.....	Female..	.....	Ventral suspension...	.....	8 hours.....	Repeated lavage. Patient placed in lateral and prone position.	Died 8 days later from erysipelas.
(21) Callender....	.....	Female..	Ether..	Hysterectomy for fibroid.	.....	2d day.....	.....	Died 4th day. Stomach reached 6 inches below the umbilicus. No peritonitis. Pulse 4 before death.
(22) Chavannaz...	49	Male....	.....	Posterior gastro-enterostomy.	43 min.	Vomiting 2d day dilatation 4th day.	Frequent lavage—hypodermoclysis.	Recovery—gained 7 kilos at end of 6 months.
(23) Chavannaz...	49	Male....	Chloroform.	(?) performed 6 1/2 months after above operation.	.....	2d day.....	Lavage.....	Recovery.
(24) Cownt†.....	26	Female..	.....	Appendectomy.....	.....	3d day.....	Stomach tube used 3d day—much gas and liquid expelled.	Recovery.
(25) Delageniere...	42	Male....	Chloroform.	Laparotomy for ruptured intestine—drainage at 2 points.	.....	Vomiting 2d day marked dilatation 3d day.	Lavage removed large amount of liquid—repeated every 3 hours. Ventral position 3 days. Hypodermoclysis.	Recovery in 20 days.
(26) Delageniere...	62	Male....	.....	Herniotomy.....	.....	Enormous dilatation in 24 hours.	Lavage; intestinal lavage; genupectoral position; ventral position gave immediate relief; hypodermoclysis.	Recovery in one month.
(27) Delageniere...	25	Male....	.....	Appendectomy and nephropepy.	.....	Vomiting 2d and 3d day.	Purgation; lavage used.....	Death on 4th day. Autopsy showed enormous dilatation of stomach—no peritonitis.

CASE REPORTS ON ACUTE DILATATION OF STOMACH.—CONTINUED

Name of operator	Age of patient	Sex	Anes- thetic	Operation	Time of opera- tion.	When symptoms appeared	Treatment	Results and remarks
(28) Eskridge.....	32	Female..	Scopol- amin, mor- phin, and ether.	Appendectomy; der- moid cyst removed.	60 min..	48 hours. Temp. 100, pulse 120.	Lavage repeated every 3 1/2 hours.	Recovery.
(29) Eskridge.....	.....	Female	Scopol- amine, mor- phine, and ether.	Appendectomy and ovariotomy.	.....	30 hours. Pulse 118.	Repeated lavage.....	Died on 4th day.
(30) Fairchild....	.....	Female.	.....	Ovariectomy.....	.....	7th day. Temp. 102. Pulse 124.	Stomach tube and lavage gave immediate relief.	Recovery.
(31) Friedman n reports case— (Bannenberg, operator).	22	Male....	Ether and chloro- form.	Appendicitis.....	.....	.....	Lavage.....	Death one week later— no autopsy.
(32) Grandin.....	.....	Female..	.....	Total hysterectomy...	60 min..	12 hrs. with tym- pany.	Tube drew a quart of dark fluid every 2 hrs. (Patient had taken only a few ounces of fluid.)	Recovery.
(33) Grandin.....	42	Female..	.....	Supravaginal hyster- ectomy for fibroid and pregnancy.	60 min..	24 hrs. with tym- pany (sort of bubbling).	Tube drew 2 quarts of fluid lavage every 2 hrs.	Died in 30 hrs.
(34) Hellendall....	35	Female..	Chloro- form.	Laparotomy for pyo- salpinx.	.....	Evening of 4th day. Pulse 140. Green vomit on 5th day. Profuse vomit- ing on 6th day.	Transfusion for collapse....	(Parotitis and abdominal abscess as complications on 15th day.) Recovery.

CASE REPORTS ON ACUTE DILATATION OF STOMACH.—CONTINUED.

Name of operator	Age of patient	Sex	Anes- thetic	Operation	Time of opera- tion	When symptoms appeared	Treatment	Results and remarks
(35) Hendon.....	.....	Female..	.....	Appendectomy and lifting of the uter- us.	.....	Pulse rapid and weak on third night.	Stomach tube drew off brownish fluid. Lavage twice daily for 5 or 6 days.	Complete recovery.
(36) Hendon†.....	37	Female..	.....	Cholecystotomy with tubal drainage.	.....	Apparently mori- bund in 48 hrs.	Tube drew several gallons of brackish fluid—second passage of tube drew off about 1/2 amount as ob- tained at former time.	Recovery prompt and com- plete.
(37) Heperline...	47	Female..	.....	Fibroma.....	.....	About 12 hrs. nauseated. Pulse 120.	Tube drew off dark green fluid; lavage every 3 hrs. for first day.	Prompt recovery.
(38) Heperline...	43	Male....	.....	Strangulated hernia..	.....	Vomiting in 12 hrs. Pulse 120. Acid fluid.	Lavage reduced pulse to 96; repeated every 3 hrs.	Recovery.
(39) Heperline...	.....	Female..	.....	Double pyosalpinx....	.....	Copious vomit- ing of dark green fluid in 24 hrs. Temp. 98 1/2. Pulse 120.	Stomach tube passed twice..	Death in 15 hrs. from onset of dilatation. Vomitus was acid and irritated the face and hand.
(40) Hopkins.....	69	Female..	.....	.....	.....	.....	.....	Died on and day. Patient was subject of chronic bronchitis—had slight pain; no fever; vomitus was greenish but with- out fetid odor. Autopsy showed dilatation of stomach and duodenum to crossing of the supe- rior mesenteric artery.

CASE REPORTS ON ACUTE DILATATION OF STOMACH.—CONTINUED.

Name of operator	Age of patient	Sex	Anes- thetic	Operation	Time of opera- tion	When symptoms appeared	Treatment	Results and remarks
(41) Hopkins.....	60	Male....	.....	Partial resection of stomach for carci- noma.	.....	2d day. Temp. 100. Pulse 160. Resp. 26.	Enema secured expulsion of gas and gave some relief. Digitalin gr. 1/50, strych- nin gr. 1/30, adrenalin 1/100; calomel; stomach lavage.	Died on 8th day after op- eration; autopsy showed stomach suture line united well, but enor- mous distension of stomach to mesenteric crossing. No peritonitis.
(42) Hopkins.....	10	Male....	.....	Appendectomy with- out drain—internal operation.	20 min..	15 hrs. Temp. 99. Pulse 140. Resp. 30.	Saline infusion per rectum. Morphin gr. 1/6, atro- pin gr. 1/150 (hypo). Stomach tube passed. Prone position.	Recovery.
(43) Hoskins.....	60	Male....	.....	Partial resection of stomach.	.....	2d. day. Temp. 100. Pulse 160.	Digitalis and calomel were given.	Death occurred in 12 hrs. Autopsy showed enor- mous dilatation of stom- ach with presence of greenish fluid. Dilata- tion of duodenum to crossing of mesenteric root.
(44) Hoskins.....	10	Male....	Ether....	Appendectomy.....	20 min.	15 hours. Temp. 99. Pulse 120. (Rose to 140).	Second day lavage was used; patient turned on face; foot of bed elevated.	Recovery.
(45) Landahl.....	13	Male....	.....	.....	.....	.....	Lavage.....	Patient was bicycle riding until 8 p. m. On follow- ing morning tempera- ture was 37.5° C., pulse 140, thirsty stomach acutely dilated. Died in 10 hours.
(46) Lanpheartt..	39	Male....	Hyo- scin, mor- phin and chlor- oform	Posterior gastro- jejunostomy.	.....	.....	Wound was open through- out on 13th day from redilatation of stomach. Under full anesthesia the extruded intestines were replaced in abdominal cavity and the wound freshened and sutured.	Recovery. Discharged in 24 days. Original opera- tion was performed to relieve dilatation of stomach due to cicatrix from old duodenal ulcer.

CASE REPORTS ON ACUTE DILATATION OF STOMACH.—CONTINUED.

Name of operator	Age of patient	Sex	Anæsthetic	Operation	Time of operation	When symptoms appeared	Treatment	Results and remarks
(47) Lee.....	45	.....	.....	Appendectomy.....	.....	2 hrs.....	Tube used with repeated lavage.	Recovery.
(48) Lee.....	43	.....	.....	Ventral hernia.....	.....	6 hrs. accompanied by vomiting.	Stomach tube and repeated lavage.	Recovery.
(49) Lee.....	.....	.....	.....	Removal of gallstones.	.....	9 hours accompanied by severe pain.	Stomach tube and lavage...	Died in 52 hrs.
(50) Littig (L. W.)*	30	Female..	Ether...	Appendectomy (No pus but septic case in house at time).	.....	48 hrs. Temp. 105.	Reopened abdomen on 4th day. Withdrew fluid and gas in large amounts. Gas expelled through tube with explosive force—lavage used.	Died on 7th day.
(51) Littig (L. W.)*	17	Female..	.....	Appendectomy (infection in house).	.....	48 hrs. Temp. 105.	Repeated lavage — patient cried for tube.	Died on 10th day.
(52) MacEvitt....	25	Female..	.....	Obstetric.....	.....	1 hr. after delivery. Temp. 103.6. Pulse 132.	.....	Died on 9th day—no autopsy, but paracentesis of stomach removed gas and distention.
(53) MacEvitt....	29	Female..	.....	Appendectomy. Hysterectomy.	.....	2nd day worse to 4th day.	Relaparotomy (as diagnosis of obstruction was made but true condition being found stomach tube was used). Lavage.	Recovery.
(54) MacEvitt....	.....	Female..	.....	Tuboovarian abscess and pelvic peritonitis.	.....	50 hours.....	Removed fluid from stomach; tube and lavage used — patient placed on side.	Intestines rose out of pelvis—stomach regained normal size and position. Recover.

CASE-REPORTS ON ACUTE DILATATION OF STOMACH.—CONTINUED.

Name of operator	Age of patient	Sex	Anes- thetic	Operation	Time of opera- tion	When symptoms appeared	Treatment	Results and remarks
(55) McMonagle...	34	.....	Ether..	.....	.....	.....	.....	Case was an alcoholic. There was no obstruction. Died after 2 days of almost continuous re- gurgitation. Stomach was filled with gas and 2 gallons of fluid filled, almost the entire abdo- men extending to pubes.
(56) McMonagle...	20	.....	Ether..	Appendectomy, General peritonitis.	.....	4th day.....	Stomach lavage.....	Recovery.
(57) McMonagle...	45	Female..	Ether..	Hysterectomy.....	.....	8th day.....	Stomach lavage. HCl was given as washings were alkaline.	Recovery.
(58) McMonagle...	53	Female..	Ether..	Hysterectomy.....	.....	7th day great thirst.	.....	Died 4th day. Enormous distention of stomach. No obstruction; organs healthy.
(59) McMonagle...	.....	Female..	Ether..	Hysterectomy.....	.....	5th day.....	Stomach lavage on 10th day.	Died 10th day. Enormous distention of stomach— infection of stump. Gen- eral peritonitis. No ob- struction.
(60) McMonagle...	.....	.....	Ether..	Removal of gallstones and gall-bladder.	.....	10th day.....	Relaparotomy and removal of gas and fluid by trocar. Stomach was washed in 8 hours and fluid was clear.	Recovery.
(61) McWilliams..	35	Female..	Nitrous oxid.	Appendectomy and myomectomy.	45 min.	3rd day. Temp. 103. Pulse 150.	Frequent use of stomach tube and lavage.	Recovery.
(62) Miller.....	27	Female..	.....	Salpingoophorec- tomy.	.....	24 hrs. Pulse 165.	Drew off dark liquid with tube 3 times—patient placed on side.	Recovery. Gauze drain was used in vaginal vault.

CASE REPORTS ON ACUTE DILATATION OF STOMACH.—CONTINUED.

Name of operator	Age of patient	Sex	Anes- thetic	Operation	Time of opera- tion	When symptoms appeared	Treatment	Results and remarks
(63) Osborn (J. W.)*	27	Female..	Ether..	Supravaginal hyster- ectomy.	90 min.	48 hrs. Temp. 101. Pulse 120.	Gastric lavage used once at end of 60 hrs. Strychnin sulp. gr. 1/30 (hypo) every 3 hours for 3 days. Star- vation for 48 hrs., then liquid diet.	Recovery.
(64) Osborn (J. W.)*	54	Male....	Ether..	Appendectomy (with drainage).	35 min.	Nausea in 40 hrs.— Vomited for next 48 hrs. at times then dil- atation.	Lavage at end of 90 hrs.— repeated every 3 hrs. for 24 hrs.—then 4 to 6 hrs. for following 24 hrs. Strychnin, whiskey (man was alcoholic).	Recovery.
(65) Osborn (J. W.)*	55	Female..	Ether..	Ventral hernia.....	120 min.	24 hrs. Temp. 100. Pulse 98.	Enema followed by lavage at end of 33 hrs. Enema every 3 hrs—strychnin gr. 1/30 (hypo) every 3 hrs. for 12 days.	Recovery.
(66) Osborn (J. W.)*	25	Female..	Ether..	Supravaginal hyster- ectomy.	95 min.	Some dilatation at beginning of operation. Great dilata- tion in 36 hrs. Temp. 100.2. Pulse 120.	Lavage—repeated in 4 hrs. Strychnin (hypo) for a week.	Recovery.
(67) Osborn (J. W.)*	40	Female..	Ether..	Supravaginal hyster- ectomy.	120 min.	48 hrs. Temp. 100.6. Pulse 140.	Refused gastric lavage. Starvation—strychnin (hypo) every 3 hrs.	Death at end 90 hrs.
(68) Osborn (J. W.)*	18	Male....	Ether..	Appendical abscess...	20 min.	Probably, some dilatation at time of opera- tion. Vomited at end of 36 hrs. Temp. 101.2. Pulse 142.	Gastric lavage—normal. Salt per rectum—stry- nin (hypo).	Died at end of 53 hrs. At end of emesis tempt. was 100.4 F. Pulse 124.

CASE REPORTS ON ACUTE DILATATION OF STOMACH.—CONTINUED.

Name of operator	Age of patient	Sex	Anes- thetic	Operation	Time of opera- tion	When symptoms appeared	Treatment	Results and remarks
(69) Filcher.....	71	Female..	Gas and oxy- gen.	Amputation of leg....	.....	24 hrs.....	Lavage every 8 to 10 hrs. Right-sided position.	Recovery.
(70) Filcher.....	54	Female..	.....	Appendectomy and hepatopexy.	.....	Nausea and belching in 30 hrs. Regurgi- tation.	Stomach lavage twice daily until 6th day. Right-sided position.	Recovery.
(71) Rodgers.....	42	Female..	Ether...	Salpingoophorec- tomy.	.....	13 hrs. Temp. 105. 150.	.....	Died on 5th day. No pain; enormous amount vomit- ed. Conscious and com- fortable to the end.
(72) Root.....	41	Female..	.....	Salpingoophorec- tomy.	30 min.	30 hrs.....	Placed on right side; later on face because symptoms returned when on back.	Recovery.
(73) Ruth (C. E.)*.	24	Female..	Ether...	Double salpingectomy suppurative (fetid).	60 min.	24 hrs. Temp. 103. 120 to 150.	Lavage; not repeated.....	Died in 24 hrs. Tempera- ture previous to opera- tion was 103.
(74) Ruth (C. E.)*.	54	Female..	Ether...	Intestinal obstruction from old operation adhesions.	110 min.	2d day with con- stant hiccough. Temp. 100. Pulse 146.	Stomach tube and lavage drew 1/2 gallon of dark brown liquid and much gas. Latter escaped with almost explosive force— in all 12 lavages were given. Hypodermoclysis used 5 times.	Recovery. No fecal odor to washings until 9th day. This washing showed many colon bacilli.
(75) Sherwood....	4	Male....	.....	Appendectomy (gangrenous).	.....	2d day.....	Lavage every 4 hrs. continu- ed to 12th day.	Recovery.
(76) Sherwood....	9	.....	.....	Appendectomy (gangrenous).	.....	Projectile vomit- ing after 10th day.	Lavage at regular intervals. Strychnine gr. 1/90 (hypo) every 3 hours.	Recovery tedious but satis- factory.

CASE REPORTS ON ACUTE DILATATION OF STOMACH.—CONTINUED.

Name of operator	Age of patient	Sex	Anes- thetic	Operation	Time of opera- tion	When symptoms appeared	Treatment	Results and remarks
(77) Smith.....		Female..	.....	Double Salpingo- oophorectomy (drainage).	.....	36th hr.....	Lavage.....	Recovery.
(78) Smith.....				Posterior gastroen- terostomy.	.....	36th hr.....	Repeated lavage.....	Recovery.
(79) Smith.....				Cholecystotomy (drainage).	.....	36th hr.....	Lavage repeated three times.	Recovery. No return of symptoms after removal of drain.
(80) Smith.....				Appendectomy.....	.....	20th hr.....	Lavage once.....	Recovery.
(81) Smith.....				Appendectomy (drainage).	.....	66th hour.....	(Not mentioned.).....	Recovery.
(82) Smith.....				Salpingectomy.....	90 min.	36th hour.....	Lavage used twice.....	Recovery.
(83) Smith.....				Appendectomy.....	.....	4 days.....	Lavage.....	Recovery.
(84) Sommarin... 15		Female..	Chloro- form and ether.	Acute dilatation of stomach with pen- dulous pylorus and cardia.	.....	.....	Stomach was punctured and gas evacuated with 2 liters of fluid. No HCl; slight lactic acid. Fistula made according to Nitzel with- out fixation of catheter to abdominal wall. Root of bed raised. NaCl solution per rectum; morphine; no food for 6 days.	Recovery. Tube removed 25th day; fistula closed 28th day; two months later bismuth shadow gram showed stomach still reaching below the umbilicus. No particu- lar discomfort.
(85) Thorn..... 32		Female..	.....	Myofibroma removed.	.....	24 hrs. vomiting and regurgita- tion.	Tube not used. Chloral 2 drms. Potassium bro- mide 1.4 drams. Tinc. digitalis 1 c.c. per rectum.	Recovery.
(86) Thorn..... 32		Female..	.....	Ovariectomy and appendectomy.	.....	Eructation of gas in 6 hours	(Not mentioned.) Tube not used.	Died in 66 hours.

CASE REPORTS ON ACUTE DILATATION OF STOMACH.—CONTINUED.

Name of operator	Age of patient	Sex	Anes- thetic	Operation	Time of opera- tion	When symptoms appeared	Treatment	Results and remarks
(87) Thorn.....	35	Female..	.....	Ovariectomy.....	.....	Erectation and vomiting in 3 hrs. with pain.	Repeated lavage.....	Died 5th day.
(88) Tissier.....	49	Female..	Chloro- form.	.....	.....	Few hours.....	Lavage gave prompt relief. As many as 5 lavages were given daily for a week.	Recovery. Vomiting which appeared early was at first thought to be due to anesthetic.
(89) Tissier.....	45	Male....	.....	.....	.....	.....	.....	Death in 15 hrs.
(90) Tissier.....	42	Female..	.....	Hysterectomy.....	.....	2d day (p. m.) Temp. 37° C.	Ether and oil of camphor....	Died 3d day (a. m.).
(91) Tobert.....	10	Male....	.....	Abdominal section....	30 min.	3d day.....	Tube and lavage.....	Recovery.
(92) Tobert reports case. (Groves operator)	43	Female..	Ether..	Supravaginal hyster- ectomy and appen- dectomy.	.....	.....	Tube was passed.....	Recovery. During opera- tion stomach was found reaching almost to pubes.
(93) Tobert.....	.....	Female..	Ether..	Cesarean section.....	.....	During opera- tion.	Lavage was done during operation—and after operation—patient placed on side. Repeated procto- lysis.	Recovery.
(94) Toma.....	34	Female..	Ether..	Ovariectomy a n d hematocoele.	75 min.	3d day, temp. 98°, pulse 120.	Repeated lavage.....	Recovery.
(95) Torrence. . .	22	Female..	.....	Gastrojejunostomy....	.....	2d day.....	Lavage of stomach for 3 successive days.	Recovery in 1 month.
(96) Van der Voordt.	17	Female..	.....	Nephropaxy.....	.....	.....	.....	52 hrs. after operation patient seemed out of danger. Died at end of 75th hr. Postmortem measurement of stomach showed greater curva- ture 60 cm.

CASE REPORTS ON ACUTE DILATATION OF STOMACH.—CONTINUED.

Name of operator	Age of patient	Sex	Anes- thetic	Operation	Time of opera- tion	When symptoms appeared	Treatment	Results and remarks
(97) Van der Voordt.	24	Female.	Chloro- form.	Hernatocoele, laparo- tomy.	.....	6th day vomiting. Temp. 36.6° C. Pulse 120, 8th day vomiting incessant.	Trendelenburg position, sub- cutaneous injections of camphor.	Recovery in 22 days.
(98) Wilkinson....	43	Male....	.....	Appendicial abscess..	.....	4th day frequent vomiting of green fluid.	Patient expired when turned on right side, 5 pints of dark green fluid expelled at this time.	Death on 5th day.
(99) Witherspoon.	32	Male....	.....	Posterior no-loop gas- troenterostomy for dilatation of stom- ach with vomiting of coffee-ground looking material (blood in stools).	.....	.....	.....	Death. Postmortem showed stomach greatly dilated but anastomosis healed and well open.
(100) Witherspoon	39	Male....	.....	Appendectomy (blood in stools).	.....	.....	.....	Death in 12 days. There was suppression of urine 3 days before death, also marked dilatation.

* Cases not previously reported. † Hendon says that he has had three other cases which he did not report because they were simply repetitions of the others and therefore a waste of time.

†† The bibliography of the Cown and Lanphear case reports has been misplaced and therefore I am not able to present them in the regular list.

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407 EQUITABLE BUILDING.