

# Roentgen Examination in Acute Dilatation of the Stomach

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## ROENTGEN EXAMINATION IN ACUTE DILATATION OF THE STOMACH<sup>1</sup>

by

*J. Frimann-Dahl, M. D.*

The condition of acute dilatation of the stomach is best known to the surgeons. Mostly it occurs in the postoperative period, but in a number of cases also, partly as a primary gastric and duodenal condition, partly purely symptomatically.

In spite of the variations in the symptoms with degree of the distention, the clinical diagnosis of acute dilatation of the stomach is comparatively simple. The patient is more or less exhausted, and the character of the vomiting or regurgitation varies. The shape of the enlarged stomach is felt on the outside of the abdominal wall by its peristaltic activity, or is determinable by percussion and auscultation. The evacuation of large quantities of stomach contents, in form of gas and liquid, on insertion of a stomach tube strongly supports the diagnosis. The situation may prove different, however, when the patient arrives with acute abdominal pain, possibly under suspicion of ileus or perforated ulcer. Rigidity of the abdominal wall or lowered peristaltic activity masks the true condition, suggesting e. g. a volvulus.

Only in the presence of gross enlargement of the stomach and abnormal quantities of gastric contents will the diagnosis of gastric dilatation come into question. Whereas the amount of gaseous contents can only be roughly estimated, is the liquid part directly measurable after aspiration. The liquid contents of a dilated stomach is generally 1—5 L.

Since the introduction and the steadily increasing use of roentgen examination as diagnostic means in acute abdominal conditions, the

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roentgenologist must learn to recognise the condition, the findings in which are capable of several interpretations. Systematic roentgen examination of all acute abdominal conditions will inevitably disclose many such cases, and a thorough knowledge of its various aspects is necessary for a confident diagnosis. Earlier roentgenologic reports concerning this subject are scarce, and consist mostly of single descriptions. The picture of a severe gastric dilatation is generally known, but less known is the variability of the findings, and the vital importance of the roentgen diagnosis in certain cases.

Acute gastrectasis is independent of the age of the patient, but it is mostly seen in elderly people, in whom specially gastric ulcer or cancer is found responsible for the stenosis. For limitation of the subject has discussion of dilatation in children (pyloric stenosis) been left out of this review. The object of the essay essentially being the discussion of the roentgenologic findings in acute abdominal conditions, also other special forms have been omitted.

The acute gastrectases may be divided into the following groups:

- |                                    |   |   |
|------------------------------------|---|---|
| I. Dislocation and anomalies . . . | { | 1. Volvulus.<br>2. Diaphragmatic hernia.<br>3. Arterio-mesenteric obstruction<br>(descensus).   |
| II. Primary organic stenosis . . . | { | 1. Cancer of the pyloric region.<br>2. Ulcer of the pyloric region.<br>3. Cicatricial pyloric changes.<br>4. Inflammations of the pyloric<br>region.            |
| III. Secondary stenosis . . . . .  | { | 1. Dislocations, enlargement of ad-<br>jacent organs.<br>2. Extra gastric inflammations.<br>3. Tumors.  |
| IV. Functional stenosis . . . . .  | { | 1. Circulatory disturbances.<br>2. Pareses (postoperative).<br>3. Increase of gastric contents<br>(aerophagy).<br>4. Disturbances in the gaseous ex-<br>change. |

Gastric dilatation is, according to the above grouping, capable of primary occurrence, as an independent disease, or secondarily, in which case it must be regarded as purely symptomatical.

### The author's material

For illustration of the various roentgen findings, a total of 20 cases have been collected from the 4 last years (3 cases from the Red Cross Clinic of Oslo), which goes to show that at a fair-sized roentgen institute the condition is not a rare one. Besides having been vitally important to the treatment of the patients, has the diagnosis in many cases offered considerable difficulties. Some of the most characteristic cases are recorded in the following.

### Dislocations and anomalies

This group includes 1 case of gastric volvulus, 2 cases of diaphragmatic hernia and 1 of arterio-mesenteric obstruction.

*Case 1.* A female of 27 years, admitted on 18/9, 46 for acute pain in left lumbar region, had earlier had recurrent attacks of violent pain below left costal arch, accompanied by vomiting. She had a feeling that all gastric activity had ceased, and she repeatedly vomited undigested food. The pain radiated to left shoulder and arm. The clinical diagnosis was uncertain, and the possibility of a left-sided renal stone was ventilated. *Urography* gave negative result. Examination revealed a high left diaphragm and an extensive fluid level below left costal arch. After the administration of contrast by mouth (Fig. 1 A—B) the fluid level was localised to the stomach, that was highly deformed and situated very high under the dome of the diaphragm. Tipped over and torsioned cardia was seen way down, the cavity part turning up towards the diaphragm. *The roentgen diagnosis was volvulus of the stomach.* A stomach tube relieved the organ of abundant amounts of gas and liquid, whereupon the stomach resumed its normal shape and size. The pain ceased and the patient felt comfortable. Later usual resection of the stomach was made to prevent recidivation. The postoperative course was uncomplicated.

*The mechanism* in the present case has probably been primary relaxation of the diaphragm. Position of the left dome of the diaphragm was, as mentioned, found 2—3 finger-widths above normal, which probably has been the primary cause of the torsion of the stomach around its mesenteric axis.

Many earlier roentgenologic reports of torsion of the stomach have been published (FELDMANN, MONDOR). This case, however, represents that of a patient arriving with acute abdominal symptoms, and admitted for routine physical examination. Torsion of the stomach leading to formation of a long fluid level, and *stratification* of the liquid gastric contents, when mixing with the contrast, are particularly noted. Treatment with stomach tube finished the symptoms, and the stomach returned into its normal position.

Torsion or volvulus of the stomach may also occur where dislocation already is present, e. g. in diaphragmatic hernia. The obstruction may

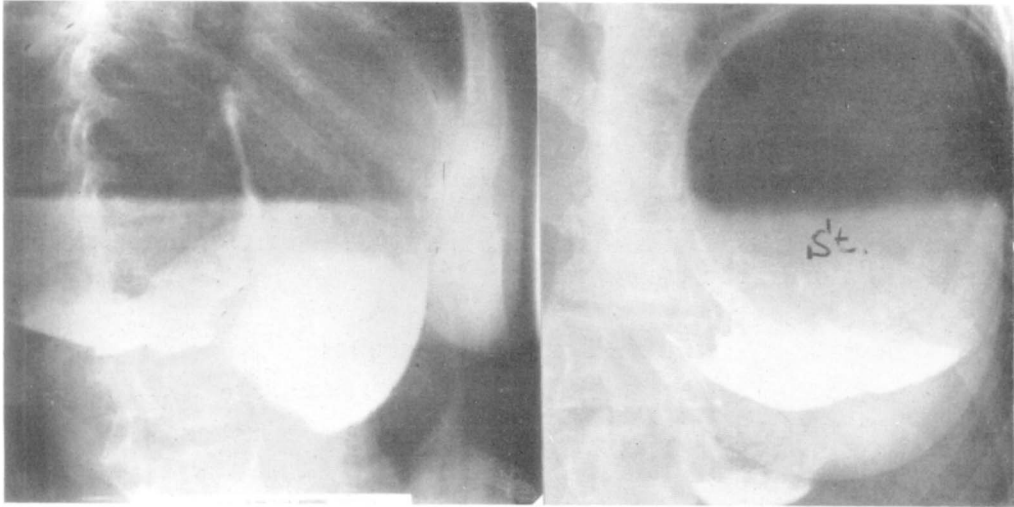


Fig. 1 A.

Fig. 1 B.

Fig. 1. Volvulus of the stomach.

A. Side view. B. Frontal view after some Barium by mouth.

be due to incarceration, and the dilatation take place either in thorax or in the abdomen.

*Case 2.* (From the Red Cross Clinic of Oslo.)

A man, 50 years old, was admitted for violent pain under right costal arch. He was moaning loudly and vomited constantly. Clinically a perforated ulcer was suspected.

*Roentgen examination* revealed dislocation of most of the stomach to thorax, and in a standing position fluid levels were distinguishable in the cascade-shaped, highly distended stomach (Fig. 2 A). When lying on his back (Fig. 2 B) torsion with twisting of the cardiac part was seen to cause dilatation of whole of the stomach. On treatment with stomach tube large amounts of gas and liquid were evacuated and the symptoms vanished. The patient was later operated upon by Dr. ASBJÖRN NILSSEN who discovered a wide aperture in the diaphragm (probably of traumatic origin), through which large parts of colon and stomach were dislocated. Reposition of the organs and closure of the aperture. Postoperative course uncomplicated. The patient recovered from his trouble. In a case like this the diagnosis without the aid of roentgen is practically impossible. The picture discloses the position and the degree of rotation of the stomach in thorax. The diagnosis dictates an adequate treatment, and the patient is promptly relieved of his pains.

Duodenal ulcerations and tumours of various kinds may occasionally cause gastrectasis. A special form, often acute, known as *gastro-mesenteric ileus*, from duodenal occlusion, is due to the mesenteric vessels riding across the duodenum ascendens anterior (PALMER). Pre- or postoperative incidences are seen, mostly in connection with general ptosis of the organs.

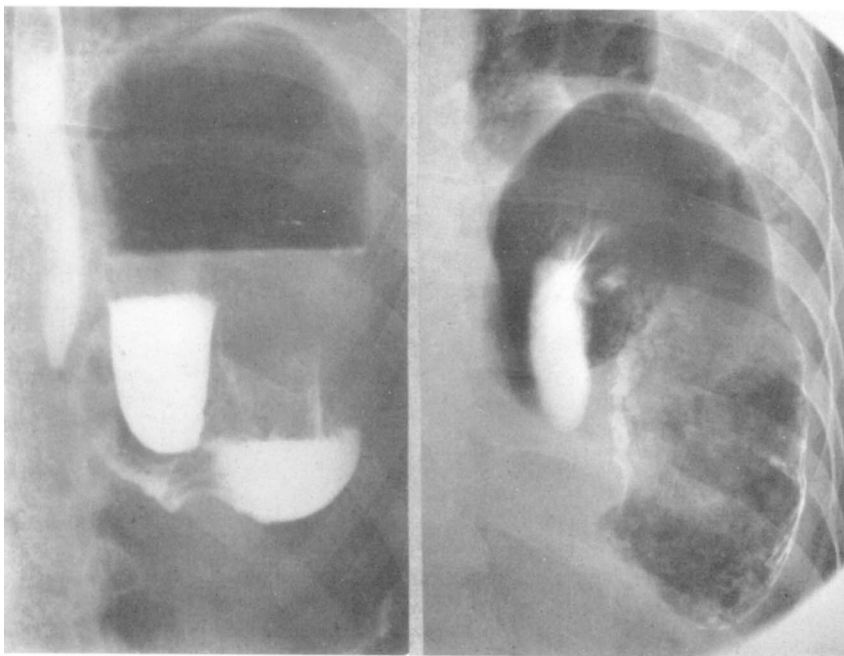


Fig. 2 A.

Fig. 2 B.

Fig. 2. Volvulus of an intrathoracic stomach.

A. Upright. B. Supine.

*Case 3.* A man, 20 years old, had for some time been troubled by periodic vomiting unattended by marked pain. He had slight dyspnea because of a vitium cordis. Alkalosis and slight uremia were found, and up to 800 cc of gastric contents were aspirated. Lying prone in bed gave the patient some short relief, but vomiting soon started up again.

*Roentgen examination* revealed severe dilatation of the stomach with retention for 12 hours. The stomach was seen way down in the small pelvis, pushing the transverse colon before it. (Fig. 3 A.) Local picture of duodenum (Fig. 3 B) showed considerable stenosis of the inferior part, and characteristic transverse section of lumen.

Operation revealed an arterio-mesenteric occlusion of duodenum, corresponding to plica duodeno-jejunalis. Gastroenterostomy. Closure of the wound. Postoperative course uncomplicated.

The condition was in this case practically subchronic. The observed pronounced descenders of the organs is generally supposed to condition arterio-mesenteric occlusion. Local view of the duodenal part is further seen capable of giving the correct diagnosis before the surgical operation.

The next group is made up from cases of organic stenosis of the stomach, particularly of the pyloric region, and also of duodenal stenosis. This latter condition very rarely leads to gross dilatation of

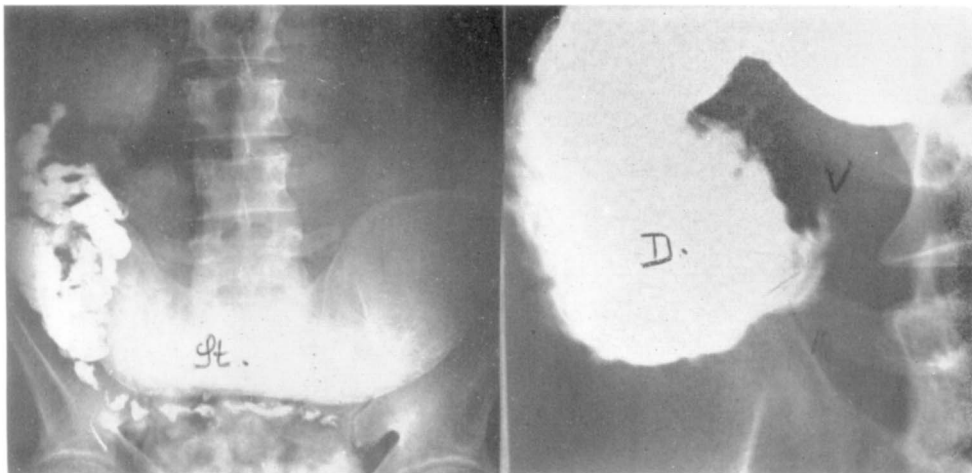


Fig. 3 A.

Fig. 3 A.

Fig. 3. A. The stomach is way down in the pelvis in standing position.  
B. Stenosis in the duodenum. Arterio-mesenterial occlusion.

the stomach. The stenosis must eventually be situated distal to pylorus, i. e. in bulbus duodeni.

### Primary organic dilatation of the stomach

*Case 4.* Emaciated male, 74 years old, admitted under the diagnosis of »ileus?», had for several years suffered from dyspepsia. On arrival he had been vomiting for 2 days. Abdomen slightly distended, and a rollshaped tumour was seen extending down towards right iliac fossa. No peristalsis was seen, no ileus-sound heard. *Roentgen examination* of the reclining patient revealed a diffuse dense area extending down into the small pelvis. In left lateral position (Fig. 4 A) a horizontal fluid level was seen, about 6—7 cm long and capped by an air-bubble. When the patient was standing up the fluid level was detected to the right of columna, and somewhat shorter than in the lateral view (Fig. 4 B). The shape of the stomach and of the somewhat deformed bulbus duodeni was recognised. The diagnosis was: severe dilatation of the stomach, probably due to stenosis in the pyloric region.

Aspiration gave 4,900 cc of liquid, whereafter the abdomen flattened, becoming soft and tender. 3 weeks later the patient was operated, and a star-shaped scar discovered on the anterior side of duodenum. Gastro-enterostomy. When discharged the patient was symptom-free.

*Comments:* According to our present knowledge of the formation of gas in ileus, the presence of gas in the stomach but not in the intestine indicates nearly full stenosis. Investigations by ANDERSEN and RINGSTED seem to prove that practically all gas, at least in the small intestine, is accumulated before the stenosis, being due to *swallowed air*. In the



Fig. 4 A.



Fig. 4 B.

Fig. 4. A. Enormous dilated stomach with fluidlevel in canal. Left side down.  
 B. Upright position. The stomach reaches the symphysis. Fluidlevel in canal on the right side of column.

present case the gas cannot flow past the pylorus, wherefore the intestine beyond this point is absolutely gas-free. Consequently this is a characteristic symptom of acute gastric dilatation due to pyloric occlusion. Here the distention and atony have evidently been as severe as to paralyse all peristaltic activity. The case shows that, because of the fluid levels, this condition is capable of resemblance to that of high ileus of the small intestine. However, size of the airbubble in a standing position and the lack of circular folds in the distended intestine should supply unmistakable evidence for the proper diagnosis. It will also be noticed that the finding of fluid levels in right iliac fossa (in left lateral position) is compatible with the location in the stomach. In other cases may predominant hyperperistalsis suggest a colonic ileus. An example hereof is met in the following description.

*Case 5.* (From the Red Cross Clinic of Oslo.)

A 60 years old woman was admitted with symptoms of ileus. There was earlier history of gastric ulcer, and now she vomited and had pain. *Roentgen examination* showed two large fluid levels in left hypochondrium and rather much gaseous distention of the small intestine, with scarce fluid levels in this part (Fig. 5 A). A barium enema was given to eliminate the possibility of a colonic ileus, suggested on the films, but showed no obstruction. The fluid levels must then be sought in the stomach, and peroral contrast was administered. A picture taken with the patient lying prone (Fig. 5 B) revealed



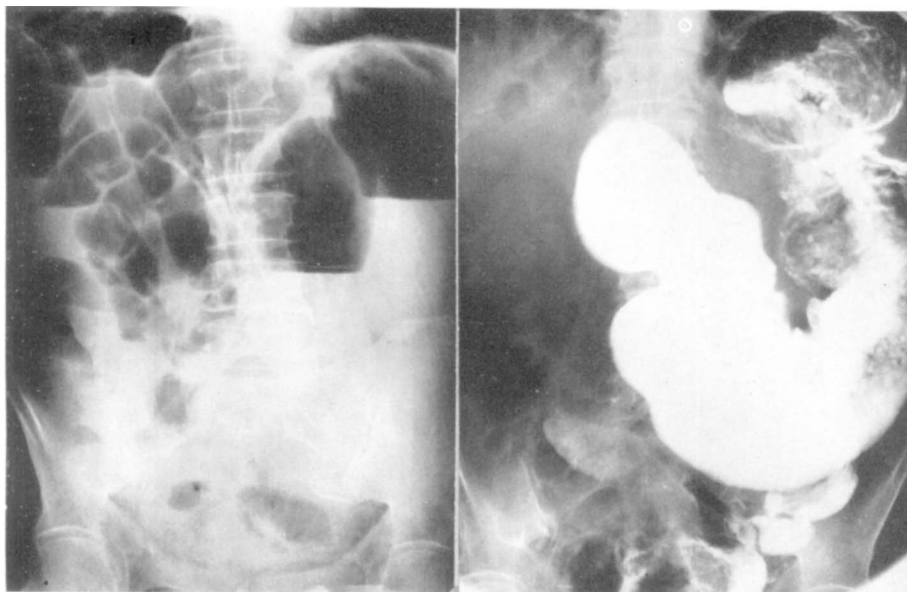


Fig. 5 A.

Fig. 5 B.

Fig. 5. A. To fluidlevels in the stomach simulating a stenosis in colon. Same case after peroral barium shows dilated stomach.

a long, considerably dilated stomach with abundant hyperperistalsis. The patient was operated. A cicatricial stricture was discovered in the pyloric region. Gastroenterostomy resulted in complete recovery.

*Comments:* This case demonstrates the possibility of confusing, clinically and roentgenologically, the two conditions of acute gastric dilatation and colonic ileus. The dilated stomach is further seen pressing upon the small intestine, causing a sort of secondary ileus-condition of this organ, marked by relative obstruction of the passage. Similar findings are made in several cases.

*Case 6.*  $\frac{7}{5}$  45 a man of 75 years was admitted under the diagnosis of ileus? For the last 3 years he had been suffering from dyspepsia. Descendens of the stomach had been shown in an earlier roentgen examination. Loss of weight: 10 kgs in course of the last 2 years.

The day previous to admission the patient had severe pain, somewhat relieved after belching of gas. No filling of abdomen, no rigidity, normal intestinal gurgling.

*Roentgen examination* revealed 5 long fluid levels in the epigastric region and considerable gaseous distention of the intestine. The finding somewhat recalled a mechanical colonic ileus with obstruction at left flexure. The distinct gaseous distention of the descending colon, however, was contradictory to this theory, the usual picture being that of collapse of the intestine beyond the stenosis. The next picture, taken after administration of some contrast by mouth, showed the situation of the stomach cavity way down

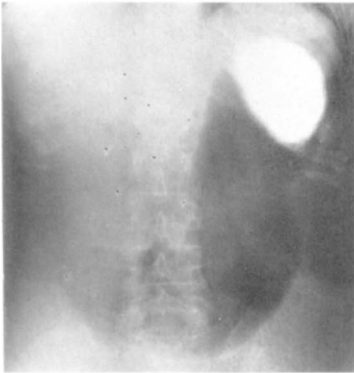


Fig. 6.



Fig. 7.

Fig. 6. Gasfilled dilated stomach with retention in acute phlegmonous gastritis.

Fig. 7. Dilated fluidfilled stomach in acute phlegmonous gastritis. Right side down.

in right pelvis. Operation one week later disclosed a callous ulcerous tumour in the pyloric region. Resection. The patient died  $\frac{20}{3}$  with signs of heart-failure. Like the preceding case, this one demonstrates the difficulty of differentiating between a long, distended stomach with *hyperperistalsis* combined with symptoms of acute abdominal condition, and a *colonic ileus*. However, peroral contrast (eventually enema) readily solves the problem.

The group of organic stenosis includes inter al. two cases of acute *phlegmonous gastritis*. Two of our six roentgenologically examined cases of acute phlegmonous gastritis show marked gastrectasis. The first one was a grossly distended stomach, showing retention for 12 hours. The gaseous distention facilitated determination of shape of the stomach, and allowed a fair estimate of thickness of the gastric wall. Also another of these cases showed severe gastric dilatation:

*Case 7.*  $\frac{10}{2}$  43 a man of 77 years was admitted to the surgical department II under the diagnosis of ileus? He had fever, chills, vomiting and pain. No certain clinical symptoms of ileus. *Roentgen examination* of the patient lying on his right side gave a long fluid level under left costal arch, and a dense shadow over rest of the abdomen (Fig. 7). The picture suggests the pathognomonic findings in acute dilatation of the stomach. No other abdominal organ is capable of simultaneously containing such air-bubble and such quantities of liquid. Aspiration gave  $5\frac{1}{2}$  l. of gastric contents. Laparotomy after some time disclosed inflammatory infiltration of the stomach and the upper part of the intestine. The operation had lethal issue. On obduction it was found comparatively slight *phlegmonous gastritis*, more prominent *duodenitis* and *phlegmonous jejunitis*.

Atony may be more or less pronounced and occasionally lead to enormous gastric dilatations, presumably when combined with a certain degree of *aerophagy*.

*Case 8.* (From the Red Cross clinic.) A 60 years old man admitted with diagnosis of volvulus? Enormous distention of abdomen and violent pain. Tympanitic percussion over abdomen and no certain ileus sound. *Roentgen examination* revealed enormous

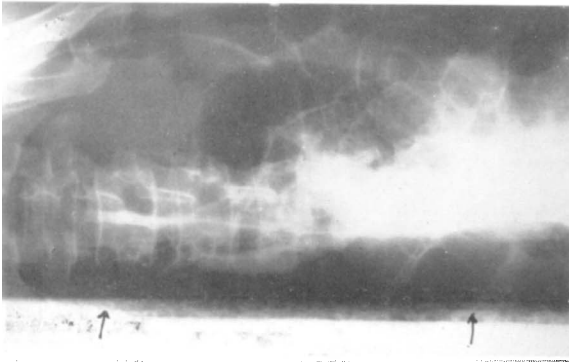


Fig. 8 A.



Fig. 8 B.

Fig. 8. A. Left recumbency. Fluidlevel in the stomach  $\frac{1}{2}$  m.  
 B. Stratification of the fluidlevel in standing position.

meteorism and a gas-carrying organ, the thickness of a thigh, in left side of abdomen. At the bottom there was a fluid level with stratification probably lying in the sigmoid colon, or in the stomach (Fig. 8). In lateral position the fluid level was nearly  $\frac{1}{2}$  m. long. Fig. 8 A. Insertion of a rectal tube did not change the picture. The patient was operated upon and an enormously dilated stomach directly pushed through the incision of the abdominal wall. As in the roentgenogram there was considerable distention of the small intestine, presumably due to pressure from the dilated stomach. A scar was detected in the pyloric region, but no certain wound nor tumor. Mors occurred in connection with the operation. The patient's family later told that just before onset of the violent pain he had eaten a very hearty meal, consisting inter al. of large quantities of bilberries. Probably that is the explanation for the sedimentation and layer formation of the horizontal fluid level in the stomach.

*Comments:* The case shows absolute atony and lack of peristaltic activity, due to gastric dilatation. *The stratification of the fluid level* should supply sufficient evidence for the diagnosis of dilatation of the stomach and not of a volvulus. Our material, consisting of about 120 cases of roentgen examined acute volvulus of the colon, shows a sort of stratification of the fluid levels only in one case. This phenomenon is probably seen only in the presence of recently swallowed and *undigested remnants of food*. The case also shows another finding repeatedly met in the present material, namely simultaneous distention

of the small intestine. These develop a kind of ileus-condition, partly because of pressure from the stomach, partly because of the increased gaseous contents (swallowed air).

### Secondary dilatations of the stomach

The group of secondary gastrectases, due to inflammatory processes in the vicinity of pylorus, includes several cases of cholecystitis and pancreatitis. No detailed description of the appearance of the stomach in these cases is needed. The present case represents a pancreatitis, possibly owing to primary cancer of the pancreas. *The roentgen picture* is dominated by the gas-filled stomach. The finding is rather unusual in this condition, in which gaseous distention of duodenum as a rule is the dominant feature. Positive gall-stone shadows are capable of supplying evidence for the diagnosis of cholecystitis. Common to these findings is the inconsistency of the condition compared to those in which organic changes of the stomach proper are responsible. Secondary dilatations may recede considerably when the patient is examined at intervals and in different positions.

Rather severe cases of *aerophagy* are not rarely found amongst the insane. A patient admitted to the surgical department II, was roentgenologically examined with a view to ileus. A general view in standing position showed severe gaseous distention of the stomach and a long fluid level. Also the presence of abundant amounts of gas in the small intestine, but no fluid level in this part.

In case of *perforated ulcer* the stomach is usually not much distended with gas. Our material of roentgen examined perforated ulcers makes a total of 200 cases. The stomach is occasionally found distended even when perforated, depending on the recent consume of the patient. One patient thus showed severe gastrectasis and local pneumo-peritoneum (Fig. 9). Accurate anamnesis informed that the patient, just before the onset of the pain, had been drinking crude alcohol, that probably had caused formation of rich amounts of carbonic acid and probably contributed to the perforation. The gastric wall is in this case seen as a thick brim with downward convex curvature, and is thus easily identified. Also in *volvulus* of the great bowel may an enormously distended sigmoid be seen in the middle and left parts of the abdomen. Characteristic is then convergence of the dense linear areas, corresponding to the walls, down towards the pelvis, that is the usual seat of the torsion. This symptom is considered almost pathognomonic for *sigmoid volvulus*. (FRIMANN-DAHL.)

If there is any doubt as to the situation of the gas, roentgenograms may naturally be taken before and after aspiration of the stomach. In



Fig. 9 A.

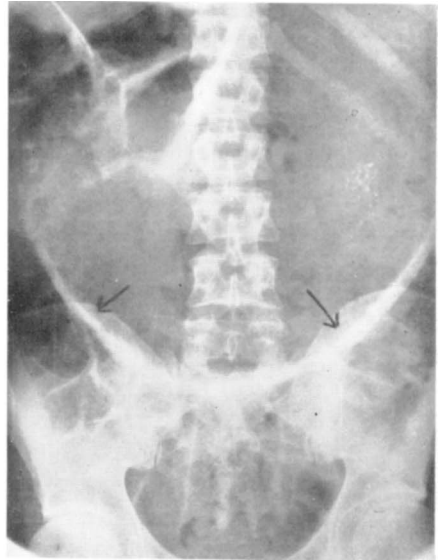


Fig. 9 B.

Fig. 9. Gastrectasia in perforated ulcer. Pneumoperitoneum shown in lateral view.

some cases, e. g. in large subphrenic abscesses, the stomach tube may with advantage be left in when the picture is taken. Position of the tube will then decide whether the gas is accumulated in- or outside the stomach. This procedure once proved very useful to us, in the case of an abscess, the size of a child's head, and with abundant gas and an extensive fluid level anteriorly in the epigastric region. The picture was capable of resemblance to that of a dilated stomach with stenosis. But roentgenogram with inserted stomach tube gave the correct diagnosis.

The development of acute gastrectasis consequent to *traumas* to thorax and abdomen is also well-known. Severe gaseous distention of the stomach has been roentgenologically demonstrated in a number of such cases.

If the patient is exhausted and ought not to be moved, the diagnosis can be made from a roentgenogram taken with horizontal direction of the rays and the patient lying on his back. In one of our cases a bullet had penetrated the lower part of thorax and upper abdomen and caused severe distention of the stomach.

Also in *fractura columnae* is dilatation of the stomach frequently seen, possibly specially where the treatment is reposition and plaster cast. (WANGENSTEEN.) Today this method is not much used here. A pa-

tient with fractura columnae, showing abdominal symptoms is at once roentgenologically examined. A more or less distributed meteorism is usually present, and the characteristic finding, according to LAURELL, of no visible fluid level in the distended intestinal loops on horizontal direction of the rays.

Finally it also must be remembered that in some internal cases a great distension of the stomach may occur. Thus in cases of *coma diabeticum* and in *uræmi* enormous amounts of gas and fluid may accumulate. Also these cases may easily be diagnosed and controlled on the roentgen films. (BERNING.)

## SUMMARY

The different forms of acute dilatation of the stomach are accounted for, and the importance of the roentgen diagnosis pointed out. With the increasing use of roentgen examination in acute abdominal conditions, the roentgenologists will be meeting with more and more of these cases, and must therefore be able to identify the rather varying findings. Clinically many cases are simulating *e. g.* perforated ulcer, ileus or volvulus. A confident diagnosis is as a rule possible after properly made roentgen examination, not rarely with peroral contrast, or after the introduction of a stomach tube.

## ZUSAMMENFASSUNG

Verschiedene Fälle von Ventrikeldilatationen werden mitgeteilt, und es wird darauf aufmerksam gemacht, dass die röntgenologische Diagnose sehr wichtig ist. Mit der steigenden Anwendung von Röntgenuntersuchungen bei akuten Bauchkrankheiten müssen diese Fälle von den Röntgenologen gekannt werden. Klinisch werden die Fälle oft mit *ulcus perforans*, *ileus* oder *volvulus* verwechselt. Die Diagnose kann gewöhnlich durch eine korrekte Röntgenuntersuchung gemacht werden, aber nicht selten erst nachdem perorale Kontrast gegeben ist, oder nach Niederführung einer Sonde.

## RÉSUMÉ

Les diverses formes de dilatation aiguë de l'estomac sont passées en revue, et l'importance du diagnostic par les Rayons Roentgen est soulignée. Vu le recours croissant à l'examen radiologique dans les affections aiguës de l'abdomen le radiologiste rencontrera de plus en plus de ces cas, aussi doit-il être capable d'identifier les constatations passablement variées qu'il fera. Cliniquement bien des cas simulent, par exemple, l'ulcère perforé, l'iléus ou le volvulus. Un diagnostic ferme est possible, dans la règle, après examen radiologique adéquat, comportant assez souvent l'ingestion de substance opacifiante, ou après introduction de la sonde stomacale.

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