Some Roentgen Manifestations of Acute Abdominal Disease

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SOME ROENTGEN MANIFESTATIONS OF ACUTE ABDOMINAL DISEASE

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The roentgen examination of a patient who presents acute abdominal symptoms is of most value when the clinician is not able to make an exact diagnosis by other means. The abdominal film may be of help, however, in confirming a specific diagnosis in a patient with a classical history and findings or in excluding certain diagnoses in a problem case.

The examination may be started with a plain film with the patient supine and additional projections then obtained as indicated; or, preferably with at least one film made with horizontal beam and the patient in the erect or lateral decubitus position. Frequently a chest film may also be helpful. A barium enema to confirm or exclude the large intestine as the site of abnormality should be done whenever the evidence is otherwise inconclusive. Unless a specific diagnosis can be made, patients with small bowel dilatation should often be studied by barium enema, as an incompetent ileo-cecal valve may cause the abnormality otherwise to be incorrectly described.

An attempt to interpret films of any kind without clinical information (with the possible exception of mass survey chest films) is not to be condoned. The radiologist cannot offer much help without such information. No attempt will be made to survey all the conditions or all the roentgen signs of acute disease, but a discussion of some of the specific appearances will be attempted.

Intrathoracic disease may produce acute abdominal signs and symptoms. Among the most frequent causes of error in selecting the abdomen as the primary site of the disease are lower lobe infarct or pneumonia and dissecting aneurysm of the aorta. Infarct may not produce its changes in the chest film for as long as forty-eight hours after the event occurs but pneumonia is usually apparent at the time of the examination. Dissecting aneurysm should be recognizable by widening of the mediastinum, loss of sharp aortic contours, signs of previous hypertension, and sometimes penetration of blood into the lungs. Films of the abdomen may show the effects of vascular insufficiency if the dissection has extended inferiorly or may show reflex ileus from the chest pain.

Vascular disease in the abdomen may cause acute symptoms. Arteriosclerotic aneurysms should be readily identified on plain scout films as fine linear calcifications usually seen best just to the left of the lumbar spine, but a better demonstration is provided by a lateral view. If there is considerable oozing from the aneurysm, the psoas shadows may be obscured and the bowel or a ureter displaced. Mesenteric arterial or venous thrombosis usually causes dilatation of the small bowel with gas and fluid; often there will be an unusually large amount of fluid in the infarcted loops with relatively less gas. Loss of mucosal folds and fine serrations are noted if contrast material enters infarcted bowel.

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The diagnosis of the ileo-colic type of intussusception, particularly common in early childhood, should ordinarily be made or strongly suspected on plain films without contrast material. The absence of the cecum from its usual position and air filling of small bowel loops in the right lower quadrant are highly suggestive. Small bowel loops following the course of the transverse colon, the arrowhead shape of air entering the proximal end of the intussusception and often air outlining the entire intussuscepted mass are confirmatory. In those patients with symptoms of only moderate severity or of short duration, the barium enema is both a conclusive diagnostic measure and a therapeutic one as a gentle hydrostatic reduction has many obvious advantages. When contrast material is introduced it is easier to see the coil spring appearance of intestine within intestine. In adults it is more common for polyp or tumor to lead the intussusception rather than the bowel or its associated lymph nodes as is the case most frequently in children. Adenomatous polyp, lipoma, and carcinoma of the right colon all may produce the typical appearance. It is much less common to recognize an intussusception in the left colon, but the same lesions in this portion of the bowel may produce the same manifestations. Meckel's diverticulum may cause ileo-ileal intussusception.

On occasion, ingested material may cause small bowel obstruction. A case of upper jejunal obstruction resulting from the ingestion of a cup of hydrophilic colloid laxative is one of the more bizarre examples. This agent caused air distention of upper jejunum (shown by closely spaced valvulae conniventes) and caused fluid density in the loop it filled and obstructed.

Biliary tract disease may result in intestinal obstruction or deformity in several fashions. The most classic is doubtless the so called gall stone ileus in which a gall stone ulcerates through the gall bladder and into the small intestine, typically lodging in and obstructing the distal ileum. Aside from the recognition of the stone, the characteristic feature is air within the biliary tree or in the gall bladder itself. A distended gall bladder may be recognized as a mass or may produce deformity of the duodenal loop or the right transverse colon.

Several types of hernia produce intestinal obstruction and they too may be demonstrated radiologically. Often an air filled loop may be seen protruding from the abdomen in the inguinal or femoral regions and if contrast material is introduced either from above or below, the actual hernia may be demonstrated. Ordinarily contrast material would not be used in these two areas. Hernia through the foramen of Morgagni is not rare; the most common structure to enter this hernia is omental fat. Following this however, the colon, stomach, duodenum, spleen, pancreas and liver may enter. Roentgen recognition involves indentifying the position and character of the air filled bowel and realizing that it lies within the lower chest rather than beneath an elevated diaphragm. The use of the Miller Abbott tube to deflate the portions of the upper gastro-intestinal tract then enables one to make a definite distinction between the upper and lower gastro-intestinal elements entering the hernia. In lesser degrees of displacement, cephalad deviation of the transverse colon and the antrum of the stomach are diagnostic signs.

Internal hernia or volvulus of the small bowel may occur in relation to many
peritoneal reflections or bands within the abdomen. The right and left paraduodenal fossae are among the most common sites. Such a hernia may cause air filling of the bowel proximal to the herniated portion and then distention of the trapped portion within the sac. The sharply localized collection of loops with generally rounded or ovoid contour should enable one to make or suspect this diagnosis. In children, particularly, mesenteric defects are a common cause. Not infrequently, herniation through the mesenteric defect will be associated with some volvulus which then produces infarction and sometimes perforation. (Fig. 1)

Fig. 1. Erect and supine films of the abdomen from a case of herniation of small bowel through mesenteric defect with resultant volvulus and infarction. Most of the small bowel was involved. The patient was 12 hours old.

Pneumoperitoneum should be recognized in a very high percentage of the cases in which it occurs. On the supine film one may be impressed first of all with a general over-all gray appearance to the film and this will be a darker gray than is caused by fluid alone. This statement also holds if there are considerable amounts of free fluid in the abdominal cavity as well. Free air can be seen against any of the peritoneal surfaces of the abdomen if a horizontal beam is employed; erect, lateral decubitus and supine films so obtained can all be useful under certain conditions. Smaller amounts of air in the peritoneum, particularly when the air is trapped, may be recognized by the air delineation of certain intraabdominal structures such as the falciform ligament which appears as a characteristic fine, sharp, oblique band in the right upper abdomen (Fig. 2), or the outlining of the outer wall of any portion of the gastro-intestinal tract. The falciform ligament, the stomach and the colon are the structures most commonly outlined on the supine film.

On occasion, the cecum may perforate in post-operative ileus even though the patient is not totally obstructed.
A much less common foreign agent in the peritoneal cavity is barium which ordinarily enters through a duodenal ulcer or a ruptured diverticulum of colon. Barium then may be seen outlining the intra-abdominal structures in a fashion quite similar to the air previously described except that the barium is heavier and tends to sink to the posterior portions of the abdomen. The outer walls of the gastro-intestinal tract are readily recognized. The barium initially in fluid suspension forms homogeneous appearing "smears" between the loops of bowel and around the other intra-abdominal structures. As times goes on, the barium tends more and more to be encapsulated in small globules and to be progressively removed from the abdomen apparently by phagocytic activity. Such patients may have repeated bouts of intestinal obstruction following this type of peritonitis.

Volvulus of the large intestine is much more common in the older age groups. Volvulus of the cecum and ascending colon should be readily recognized in all cases in which displacement of the cecum occurs, but some of the axial torsions are more difficult to recognize. Quite commonly the cecum becomes greatly dilated with gas and swings into the left upper quadrant when volvulus occurs; confirmation by barium study frequently discloses the beak shaped barium pattern of twisted mucosal folds at the site of the volvulus. These patients are sometimes able to evacuate some of the gas trapped in the cecum following the barium enema and thus on occasion it is therapeutic. Volvulus of the cecum is one of the conditions in which there is frequently considerable gas in the colon distal to the site of the mechanical obstruction. The recognition of the haustrations of the right colon and of the ileo-cecal valve or the characteristic shape of the tip of the cecum should enable one to make the diagnosis or suspect it and have it confirmed by barium enema.

Volvulus of the sigmoid presents an inverted "U" shaped distended loop of large intestine arising out of the pelvis and quite frequently swinging either to the mid-line or to the right of the mid line and often extending up to the level of the diaphragm. The lower ends frequently are pointed because of the twist. Fluid levels can be demonstrated by upright films and again barium will demonstrate the twizzling of the mucosal folds. It is sometimes possible to treat these patients conservatively by a tube or proctoscopic deflation, following demonstration of the site of the twist. It is more common for a volvulus of the sigmoid to fill the whole abdomen than it is for volvulus of the cecum.

In any case of obstruction of the gastro-intestinal tract of any type, fluid filled loops are of considerable significance and are just as important to recognize as the typical air filled or air and fluid filled loops. As mentioned above, a predominance of fluid filling suggests a vascular lesion of some type.

The dermoid cyst usually presents a specific appearance. There is a radiolucent ovoid or lobulated contour due to the fat content and there are associated calcifications. The erect film shows layering of the fatty material above and the fluid density material below.

Patients with sprue commonly present a challenge to both clinician and radiologist when they develop abdominal pain. They may develop considerable dis-
tention of the small bowel with gas and fluid without having any mechanical cause unless the ingestion of a somewhat larger than usual meal may be one of the precipitating factors. The bowel in sprue has a decreased propulsive power and many of these patients have apparently had enough of this type of change to get into trouble. Some of them have been subjected to several fruitless laparotomies.

Among the additional conditions which may cause bowel distention are pheochromocytoma, lead poisoning, hysteria, muscular dystrophy, and severe pain due to injury elsewhere in the body.

**SUMMARY**

1. The roentgen examination of the abdomen is of most value when other methods do not make a specific diagnosis possible.

2. On many occasions roentgen findings will make possible a specific diagnosis.

3. Frequently roentgen examination will offer supportive or confirmatory evidence for a clinical diagnosis.

4. As with many other examinations, abdominal films are of most value when studied after consultation on the clinical evidence.

![Fig. 2a](image)

**Fig. 2a.** Perforated duodenal ulcer in a 19 year old male. Note the fine sharp oblique band formed by the falciform ligament.

**Fig. 2b.** Enlargement of the right upper abdomen from 2a.