Role of radiology and imaging in the diagnosis of acute abdominal conditions

Miah MAY

Introduction
In our day to day practice we have to face many of the acute abdominal conditions. As we know acute abdomen means the patient complaints of an acute attack of pain in abdomen which may occur suddenly or for a period of several hours and gradually becoming worse and demands an urgent diagnosis, treatment and even surgical intervention. Early accurate diagnosis is essential for proper management. A careful history and examination findings are very very essential for the radiologists also to give a comment about the cause of the disease.

Though not all, many of the cases may be diagnosed without the help of any diagnostic tool. Some cases may be problematic. In those cases Radiology and Imaging can help a lot in determining the proper diagnosis.

Usual radiological tools we use are
1. Plain film of abdomen and Chest P.A in erect posture
2. U.S
3. C.T.Scan (Occasionally)
4. MRI (Rarely)

What we see in plain radiography
(a) In most acute abdominal conditions the radiological diagnosis depends on gas patterns e.g. distribution of gases in dilated & non-dilated bowel, presence of gas inside or outside the bowel lumen.
(b) Radiopaque shadow
(c) Fluid and gas levels.

What are the radiographic techniques
1. Supine abdomen: We can see the distribution of gas and calibre of the bowel and may show displacement of bowel gases by a mass.
2. Erect abdomen: To see fluid levels and free gases. Usually 3 or more small bowel fluid levels longer than 2.5 cm are abnormal.
3. Left lateral decubitus: Patients lying on their left side and the X-ray beam is horizontal. Patients who are unfit to sit or stand for an erect film, it is the projection of choice to show a small pneumoperitonium. In this projection free gas may be trapped between the edge of the liver and the lateral abdominal wall, or sometimes in the pelvis where it is the highest point specially in case of female.
   (a) Erect chest film is the best film to show the presence of a small pneumoperitonium.
   (b) A number of chest conditions which may mimic acute abdomen:
      1. Lower lobar pneumonia
      2. Myocardial infarction
      3. Pulmonary infarction
      4. C.C.F
      5. Pericarditis
      6. Leaking or dissecting thoracic aortic aneurysm
      7. Pneumothorax
   (c) Acute abdominal conditions may be complicated by chest pathology: e.g. pleural effusion frequently complicate acute pancreatitis, following prolong vomiting in elderly patients in intestinal obstruction, there may be pneumonia or heart failure. Abdomen may be compared with a pandora's magic box. There are many causes of acute abdomen of which some are common which we face at our day to day practice. I want to show some of the radiological findings system wise.

Common acute abdominal conditions found in relation with G.I. Tract
(A) Acute appendicitis: Commonest acute surgical condition in the developed world. No role of radiography. But can be done to exclude other causes. Direct visualisation by HRSG Puylaert JB

Dr. Md. Abu Yusuf Miah, MBBS, DMRD,
Asst. Prof. of Radiology and Imaging, DMCH,
Dhaka
graded compression technique. The fat and the bowel loops are displaced by compression. Inflamed appendix appears to be a thick walled incompressible sausage like tube with concentric layers in transverse plane. Perifocal oedema is also present. Fluid is also seen in the lumen of appendix. It is elongated tube with one end blind. When wall thickness exceeds 6 mm it is suggestive of inflammation.

**(B) Pneumoperitoneum:** Demonstration of small pneumoperitoneum is very essential. Most of the cases the cause of the pneumoperitoneum will require emergency surgery.

**(C) Pseudopneumoperitoneum:** A number of conditions which simulate pneumoperitoneum e.g.,
1. Chilaiditis syndrome - Distended bowel between liver and right dome of diaphragm
2. Sub diaphragmatic fat - omental fat
3. Curvilinear pulmonary collapse

**(D) Intestinal obstruction:** Dilation of bowel occurs in
1. Mechanical intestinal obstruction
2. Pseudoobstruction
3. Paralytic ileus
4. Air swallowing
5. Several other conditions.

Radiological differentiation depends mainly on the size, mucosal appearance and the distribution of loops of bowel. The diagnosis of intestinal obstruction depends on the demonstration of dilated loops of bowel proximally with non-dilated or collapsed bowel distal to the presumed point of obstruction.

**(A) Acute gastric dilatation:** Dilatation of the stomach can be caused by 4 main groups of conditions--
(I) Mechanical gastric outlet obstruction may be a sequel of peptic ulcer or a carcinoma of the antrum.
(II) Paralytic ileus - This group of conditions is frequently referred to as acute gastric dilatation.

(III) Volvulus and air swallowing are usually uncommon conditions.

**(B) Small bowel obstruction:**
Usual causes are the bands, adhesions and strangulations. Complete obstruction of the small bowel usually causes small bowel dilatation with accumulation of both gas and fluid and a reduction in calibre of the large bowel. Plain film changes in small bowel obstruction may appear after 3-5 hours if
there is complete small bowel obstruction and such changes are usually marked after 12 hours. In incomplete obstruction early films may be normal.

This slide shows the feature of gall stone ileus. Here you see multiple dilated loops of small bowel with a band of gas within the CBD. Gall stone ileus is a mechanical obstruction caused by the impaction of one or more gall stones in the intestine, usually in the terminal ileum and rarely in the duodenum.

Slide no.6-Show acute gastric dilatation

Slide no. 7- Shows Small bowel obstruction: Multiple dilated loops and air fluid level. A very small amount of gases are noted in the large bowel.

Differentiating points between a small and large bowel obstruction:

<table>
<thead>
<tr>
<th></th>
<th>Small bowel</th>
<th>Large bowel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Distribution of loops</td>
<td>Central</td>
<td>Peripheral</td>
</tr>
<tr>
<td>2. No. of loops</td>
<td>Many</td>
<td>Few</td>
</tr>
<tr>
<td>3. Volvulae conniventes</td>
<td>Present in jejunum</td>
<td>Absent</td>
</tr>
<tr>
<td>4. Hastral markings</td>
<td>Absent</td>
<td>Present</td>
</tr>
<tr>
<td>5. Diameter</td>
<td>3-5 cm</td>
<td>Large</td>
</tr>
<tr>
<td>6. Radius of curvature</td>
<td>Small</td>
<td>Large</td>
</tr>
<tr>
<td>7. Solid feces</td>
<td>Absent</td>
<td>Present</td>
</tr>
</tbody>
</table>

String of beads sign:

What is that: In dilated small bowel which is almost completely filled with fluid. Small bubbles of gas may be trapped in rows between the Volvulae connivantes on horizontal ray films- this is known as String of beads sign. This sign if present is virtually diagnostic of small bowel obstruction.

Signs of gallstone ileus

a) Gas within the bile duct b)Features of small bowel obstruction c)Abnormallocation of gallstone d)Other previous findings which coincides biliary stone.

What are the other causes of gas in the biliary tree:

a)Physiological if the sphincter is laxed. b)Following biliary surgery c)Malignant fistula d)Perforated peptic ulcer into the bile duct.

Its a case of intussusception is seen in children under 2 years of age. In children it usually commences in the ileum as the result of inflammation of the lymphoid tissue and tends to be associated with mesenteric adenitis. The enlarged lymphatic patches are forced into the ileum by peristaltic movement and acting as a tumour. So one part of the ileum is pushed into the other and causing intussusception. In adults intussusception is invariably caused by a tumour of bowel. A barium enema examination is frequently required to establish a definite diagnosis and sometimes also relieves the patient.

Contrast enema examination of large gut of a baby shows the intussusception producing a...
concave defect in the head of the contrast column. Sometimes contrast medium may pass beyond this, causing the well known coiled spring appearance.

(iii) Large bowel obstruction: Usual causes are the a) Carcinoma -60% is situated in the sigmoid colon b) Diverticular disease c) Volvulus of the colon.

Key to the radiological appearance of the large bowel obstruction depends on the state of the competence of the Ileocaecal valve. The obstructed colon invariably contains large amounts of air and can usually be identified by its location and by the presence of haustral markings.

When both small and large bowel dilatation are present in a case of large bowel obstruction, the radiographic appearance may be identical to those of a paralytic ileus. Paralytic ileus causes when intestinal peristalsis ceases and as a result fluid and gas accumulates in the dilated bowel. It is frequently found in cases of peritonitis and in the post operative cases. Along with the radiological findings, history and clinical signs are helpful in differentiating between large bowel obstruction & paralytic ileus.

Acute pancreatitis: Clinical diagnosis may be difficult in the initial stage. Other acute abdominal conditions such as perforation, acute cholecystitis, acute peptic ulcer have to be included in the differential diagnosis. A large number of radiological signs have been described, most of them are non-specific. USG and CT are the diagnostic modality.

The normal pancreas has about the same echogenicity as that of liver but its echogenicity increase with age. When we scan the pancreas we usually identify the following anatomical landmarks:

1. Aorta
2. Superior mesenteric artery
3. Superior mesenteric vein
4. Liver etc.

Average diameter of the head of the pancreas is 2.8 cm. body 2 cm and tail 2.5cm, duct diameter less than 2mm.

In acute pancreatitis pancreas is diffusely enlarged and oedematous which is hypoechogenic in comparison with the liver parenchyma. Diffusely enlarged irregularly hypoechogenic pancreas may also seen in
acute pancreatitis when it is superimposed on chronic pancreatitis. C. T. is the investigation of choice for such cases.

Fig. no. 14 - Shows diffusely enlarged and oedematous Pancreas
Pain in the right upper abdomen which increased in the inspiratory phase and may be due to subdiaphragmatic collection.

**Liver abscess** - Sometimes abscess in the liver may give rise to the symptoms of acute abdomen.

Ultrasoundography shows the presence of abscess in the anteriolateral aspect of the right lobe of liver.

Ultrasoundography shows two large anechoic areas with numerous small internal echoes. These are the abscesses within the right lobe of liver.

Hydatid disease of the liver may cause pain abdomen particularly when it bursts and it may be a fatal condition due to shock.

Ultrasoundography shows the presence of subcapsular cystic lesion of the liver.

RENAL SYSTEM

A larger number of patients of renal calculi and acute ureteric obstruction due to stone present as an acute abdomen. Plain film of abdomen can diagnose about 80% of renal calculi.

Renal stones

Ultrasoundography shows calyceal dilatation due to ureteric stone.

Ultrasoundography shows a calculus in the lower end of the ureter.

Ultrasoundography shows a calculus in the anterolateral portion with dilatation of the lower end of the ureter.

Ultrasoundography shows calyceal dilatation due to ureteric stone.

Ultrasoundography shows a calculus in the lower end of the ureter.

Ultrasoundography shows calyceal dilatation due to ureteric stone.

Ultrasoundography shows a calculus in the lower end of the ureter.

Ultrasoundography shows the presence of ectopic pregnancy.

Ultrasoundography shows the presence of ruptured ectopic pregnancy.

CONCLUSION

For proper diagnosis and management of a case of acute abdomen detailed history of the patient and examination findings and other supportive findings are very essential. Update knowledge about the traditional plain abdomen radiograph and modern modalities play a key role in the diagnosis and management of Acute Abdominal Conditions.