SONOGRAPHIC DIAGNOSIS OF GASTROINTESTINAL DISEASES IN THE ADULT

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Until recently sonography of the bowel was considered as 'Tiger Territory' because for years the gastrointestinal tract (GIT) had created problems due to scattering effect of gas. Similarly fluid filled bowel had mimicked cysts and faeces as pseudo tumours. The advent and widespread use of real-time sonography has greatly improved diagnoses of bowel pathology. Today sonography of the bowel is the last frontier for the sonologist who enjoys a challenge.[1]

Bowel abnormality is seen on sonography when there is bowel wall thickening or intraluminal/extraluminal fluid is present, which makes certain characteristics readily apparent. The bowel frequently appears of target configuration and is commonly seen in the region of the antrum of the stomach, transverse colon and the caecum. The bowel wall appears echo-poor while the central echo-complex is echogenic and is related to bowel mucosa, mucous and other bowel contents. In the normal circumstances the bowel wall thickness is less than 5 mm. This rule applies from the oesophagus to the rectum. The total diameter of the target is less than 3 cm. Bowel thickening over 5 mm is almost always abnormal albeit nonspecific and may be related to infections, inflammations, oedema or neoplasia. When the bowel is asymmetrically thickened by a disease process this results in the so called atypical target sign or a 'pseudo-kidney' sign (Fig. 1). In this case the central echo-complex is asymmetrically placed. This is again non-specific but is always abnormal as long as a true cross section of the bowel has been taken. An atypical target sign may be caused by neoplasia, infections or inflammations.[2,3]

Fluid Filled Bowel

Fluid within the bowel may make valvulae conventes or haustra visible thus identifying the segment of the bowel looked at. Sonography can differentiate between intestinal obstruction and ileus. Ultrasound may also delineate the site and occasionally the cause of intestinal obstruction. When extraluminal fluid is identified with an adjacent dilated loop of fluid filled bowel[4] in the absence of ascites, perforation may be suspected (Fig. 2) Gastric outlet obstruction is readily identified.[5] The cause can occasionally be identified and a specific diagnosis of Bouveret Syndrome (Gastric outlet obstruction due to gall stone) may be made.

Thickening of the Bowel Wall

Carcinomas of the G.I.T. usually present as an atypical target sign which may involve any part of the bowel from the oesophagus to the rectum. It may not be

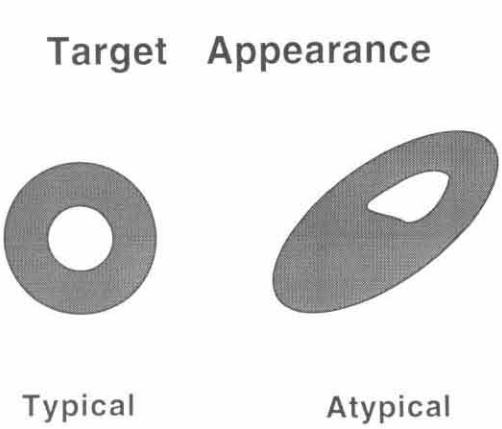

Fig. 1. Line diagram of Target Signs.

Fig. 2. Perforated abdominal viscus, fluid (arrows) is seen outside the dilated jejunum.

possible to define the exact anatomical site. Liver, lymph node or peritoneal metastases may be apparent.[5] (Figs. 3, 4, 5, 6, 7 and 8).

Gastric Leiomyosarcoma or Leiomyoma

Most smooth muscle tumours present as a large abdominopelvic mass, which may at times be difficult to differentiate from ovarian tumours in the female. Gastric leiomyosarcomas, the second most commonest sarcoma, account for 1–3% of primary gastric neoplasms. Their diagnoses is

Fig. 3. Atypical target sign due to carcinoma lower oesophagus (arrow). L represents left lobe of liver.

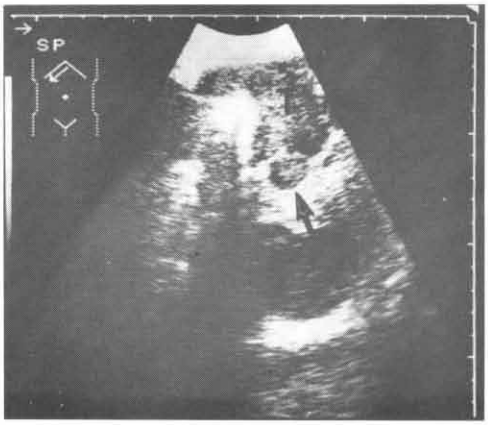

Fig. 4. Carcinoma of the stomach Tumour = T Lymph node metastases = LN (arrow).

important because of the more favourable prognosis associated with them than with gastric carcinoma. They are generally globular or irregular and may become huge outstripping their blood supply. Sonographic features of the tumour reflect the underlying pathologic process. A tumour with a substantial intraluminal component presents as an echogenic mass within the stomach.[6] Extra-gastric extension can appear as a large multi-loculated complex mass. When such a large complex mass is seen in our experience they are almost always associated with an atypical target sign and should always be sought.[7] (Fig. 9).

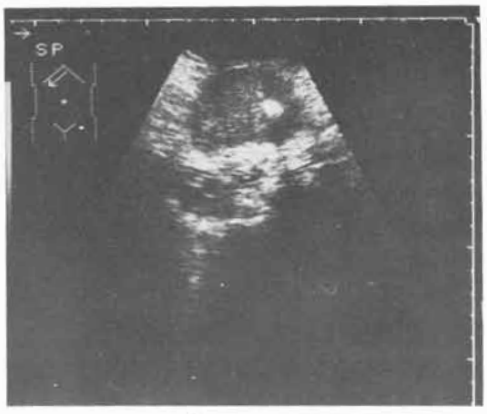

Fig. 5. Atypical target sign due to carcinoma of the duodenum.

Fig. 7. R K = Right kidney. PK = Pseudokidney (Atypical target sign) due to carcinoma of the ascending colon.

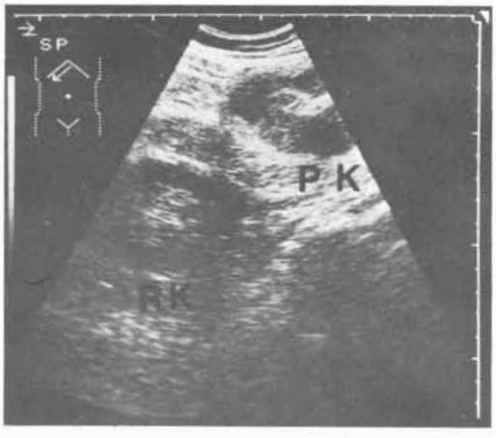

Fig. 6. Atypical target sign due to carcinoma of the duodenum.

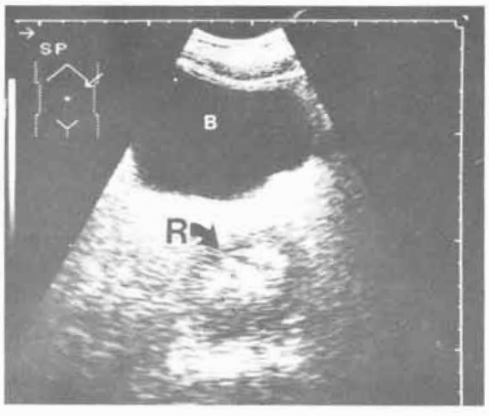

Fig. 8. Carcinoma sigmoid colon.

Lymphoma

This may represent a primary bowel involvement or the bowel may be involved as part of more widespread disease. Bowel wall infiltration by lymphoma is characteristically anechoic often with associated lymphadenopathy which may extend to the root of mesentery producing the so called 'sandwich sign'. The bowel is not entirely rigid and may comply to proximal peristalsis pushing contents through the involved area, therefore, obstruction is not an early feature.[9]

Inflammatory/Infective Disease

Crohn's disease and intestinal tuberculosis can give rise to variable appearances. The appearance may be those of atypical target sign with a bowel thickness over 5 mm or an atypical target depending upon whether the infiltration is diffuse or focal.

Other findings include a solid abdominal mass, distended fluid filled bowel loops, luminal narrowing, stiffening of the bowel resulting in reduced peristalsis. Ulcerative colitis may be more difficult to detect on sonography, since wall thickness is not a prominent feature as in Crohn's disease or tuberculosis.[11]

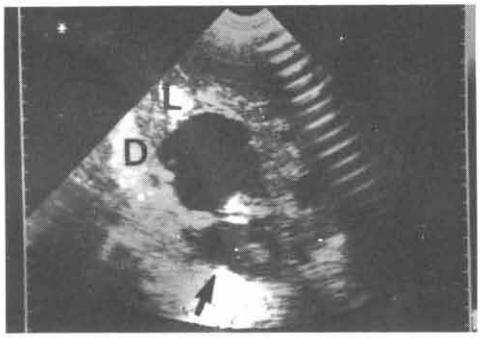

Fig. 9. Leiomoyosarcoma of the stomach, a cystic (c) is associated with atypical target sign (arrow). D represents the diaphragm, L the left lobe of the liver.

Ischaemia

Sonographic features depend upon the spread of vascular insult. Intramural haemorrhage often occurs. Haemorrhage may initially be echo-poor but becomes echogenic by development of thrombus organization. With frank necrosis there is no distinction between bowel layers and portal venous gas may be seen.

Pseudomyxoma Peritonei

Rupture of mucocele of an appendix or a mucinous cystadenoma of the ovary may give rise to pseudomyxoma peritonei. There is exudative ascites with multiple strands and debris (Fig. 10).

Appendicitis

A confident diagnosis of appendicitis may be made by high resolution sonography with graded compression. The diseased appendix appears as a non-compressible aperistaltic tubular structure with a central dilated lumen. The lumen is surrounded by an inner echogenic mucosal layer and an outer oedematous wall. An appendolith may be recognized.[12,13] (Fig. 11).

Diverticular Disease

Diverticular disease presenting as an atypical target sign may be indistinguishable from a bowel carcinoma. However, inflammatory fluid surrounding the lesion favours diverticulitis.

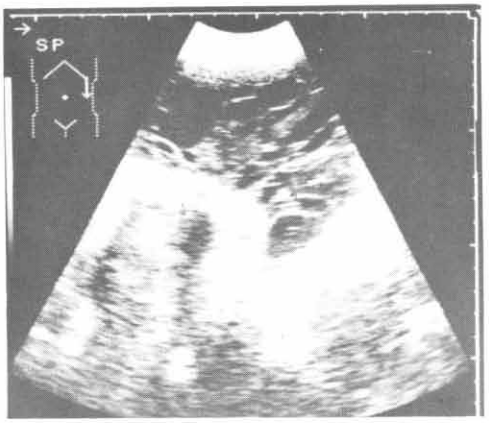

Fig. 10. Pseudomyxoma peritoni, note exudative ascites with debris and strands.

Fig. 11. Appendicitis, shown by a mass (M), appendolith (arrow), s=shadowing from appendolith.

Haematoma

Intramural haematomas secondary to trauma or bleeding diathesis are recognized initially as anechoic spaces in the bowel wall, latter as the haematomas organize they become echogenic. Haematomas may extend into the mesentery.

Intestinal Lymphangectasia

Fluid filled lacteals secondary to lymphatic obstruction appear as anechoic spaces

Fig. 12. Concentric ring appearance of an intussusception.

conforming to the geometry of the surrounding tissues. They are easily distorted by peristalsis.

Intussusception

The appearances may be diagnostic when multiple echogenic rings are produced by alternating mucosal and muscular layers.[14] An intussusception may also produce an atypical target sign.[9] In adults there is often associated tumour at the apex of the intussusception which can sometimes be seen.[16] (Fig. 12 and 13).

Gastric Bezoars

Sonographic diagnosis of a trichobezoar may be relatively specific. A broad band of high amplitude echoes can be seen superficially with complete acousting shadowing. The clear nature of acoustic shadow should suggest either a foreign body or tissue (e.g. calcified mass) rather than gas. The later characteristically produces dirty shadowing[16] (Fig. 14 and 15).

Gastric Amyloid

Amyloid deposition results in a diffuse increase in the gastric wall thickness which appears echo-poor.

Abscesses

Abscesses present as anechoic masses but may be hyperechoic due to the presence of gas. The adjacent organ may

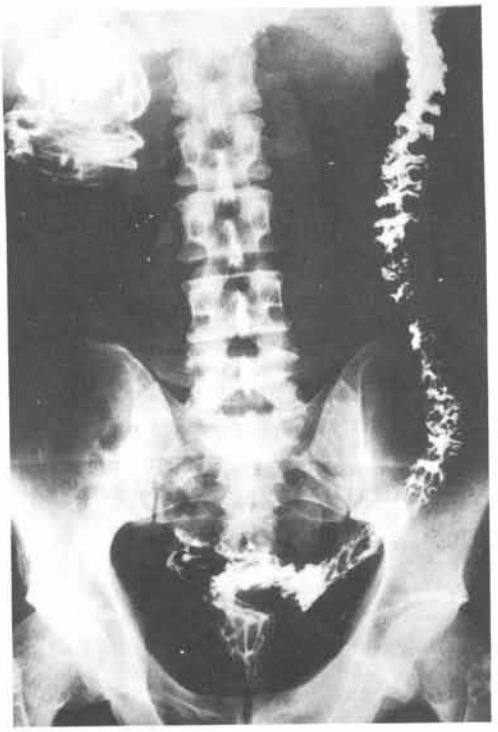

Fig. 13. The same patient as in Fig. 12; a Barium Enema confirms an intussusception in the hepatic flexure.

suggest the origin of the abscess i.e. appendix.

Duplication Cysts

GIT duplication cysts can occur anywhere between the oesophagus and rectum. Sonographically they are seen as cystic structures with variable wall thickness. Occasionally debris may be seen within the cyst. The intraluminal surface of the wall may be smooth or rugged.

Amoebic Colitis

In common with other bowel pathology, amoebic colitis may present as an atypical target sign. The asymmetrically thickened wall appears hypoechoic ranging in thickness from 8–17mm. The hypoechoic wall surrounds a strongly echogenic gas containing lumen. When concomitant liver abscess is identified in an endemic area,

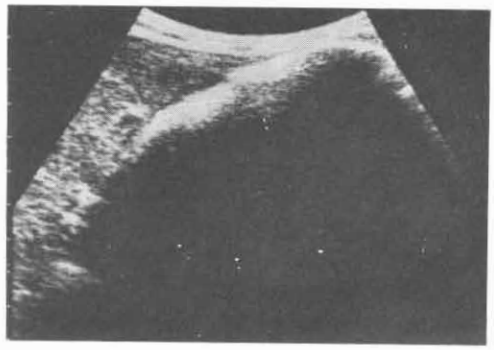

Fig. 14. A trichobezoar in the stomach.

diagnoses of amoebic colitis may be strongly suspected.

SUMMARY

Sonography is a cheap, non-invasive, non-ionizing, quick and accurate technique which has made a great impact in diagnosing gastrointestinal disease in infants and children. It is making in-roads into adult bowel pathology where most lesions are picked up incidently but a deliberate search for G.I.T. lesions is proving extremely rewarding.[7] Sonography is fast becoming the modality of choice in an acute abdomen.

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Fig. 15. A Barium Meal in the same patient as in Fig. 14, showing a large intraluminal defect due to trichobezoar.

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