Differentiation between sigmoid volvulus and free air on supine abdominal radiographs: the 'liver overlap sign' versus the 'football sign'

WFC van Gelderen

MBChB, FFRAD(D)(SA),

Consultant Radiologist, Wanganui Base Hospital, Wanganui, New Zealand

Abstract

Two cases are presented which emphasize the difficulty of differentiating between a sigmoid volvulus, where the 'liver overlap sign' is the only sign present, and perforation of a hollow viscus where the only sign on a supine abdominal radiograph may be the 'football sign' simulating a 'liver overlap sign'. In the case of sigmoid volvulus described in this report, the correct diagnosis was established only with much difficulty and after further conventional radiographs and contrast studies.

Case reports

An 89 year old man presented with a three day history of marked abdominal distention and pain. Clinical diagnoses of subacute intestinal obstruction or perforation were considered. A supine abdominal radiograph revealed a curvilinear demarcation, convex to lateral, overlying the liver with the area lateral the demarcating line uniformly dense and the area medial to this of relatively low attenuation (Figure 1a). This was thought to represent the superolateral aspect of the 'football sign' overlying the liver, but upright chest radiographs failed to reveal any subdiaphragmatic free air.

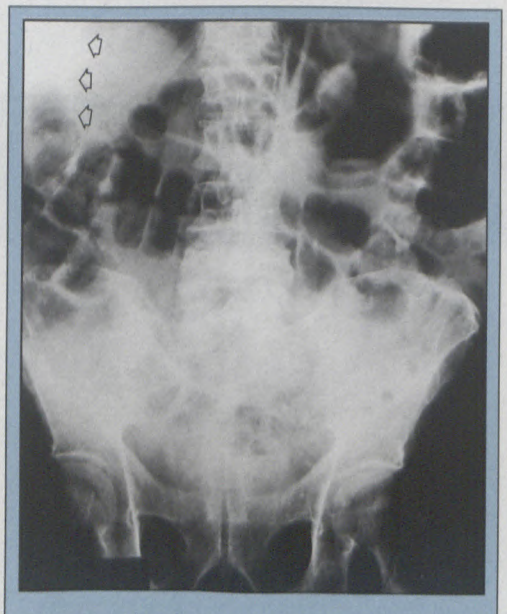

Figure 1a: Supine abdominal radiograph with 'liver overlap sign' (arrows) of sigmoid volvulus masquerading as 'football sign' of intraperitoneal free air. Confirmed as sigmoid volvulus (cf. Figure 1c).

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A left side down decubitus x-ray did not show any free air, but a right side down decubitus film demonstrated apparent air outlining bowel wall (Figure 1b) which retrospectively was due to a large distended loop of overlying large bowel simulating the appearance of air on both sides of the walls of small bowel loops. The 'triangle sign' was also present with multiple triangles of 'free air' between bowel loops masquerading in a similar way.

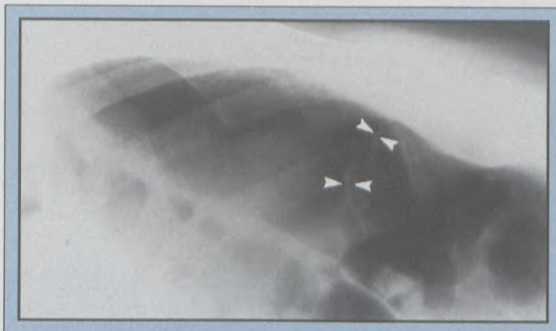

Figure 1b: Right side down decubitus radiograph of abdomen with free air on both sides of small bowel wall (arrows) being simulated by overlying distended loop of large bowel.

A gastrografin meal did not reveal any evidence of perforation. A subsequent gastrografin enema, however, demonstrated the typical appearance of a partially obstructed sigmoid volvulus (Figure 1c). The patient felt most relieved after a massive evacuation of faecal material following the gastrografin enema. The sigmoid volvulus was repaired surgically on an elective basis with good results.

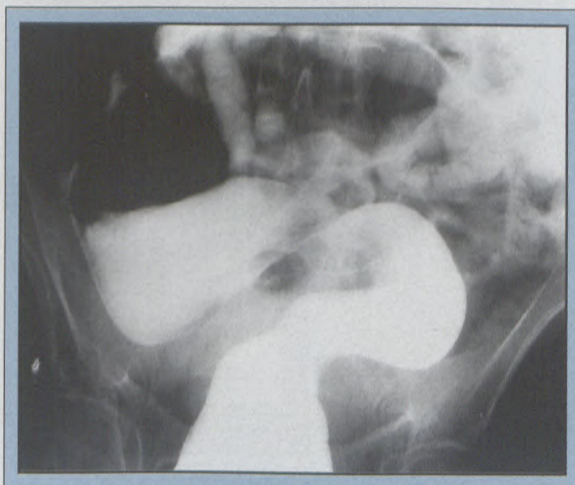

Figure 1c: Gastrografin enema demonstrating typical signs of partially obstructed sigmoid volvulus.

A supine abdominal radiograph of a 63 year old man revealed intraperitoneal free air due to a perforated duodenal ulcer, also demonstrated on chest radiographs, and is shown as comparison to the previous case (Figure 2). The similarity of free air with a 'football sign' overlying the liver to the previous case is remarkable.

Discussion

Approximately one-third of 40 confirmed cases of sigmoid volvulus were considered to be difficult to diagnose on conventional radiographs[1] and the above case belongs to this category. The 'liver overlap sign' was found to be of considerable diagnostic aid in those cases where the greater part of the sigmoid loop was obscured by proximal colonic distension. The sign was positive in 27 out of 40 patients with the right side of the distended sigmoid loop overlying the liver in curvilinear fashion.

In the above case of sigmoid volvulus the 'liver overlap sign' was the only obvious sign of sigmoid volvulus and even in retrospect the other described signs[1,2] were difficult to detect. The absence of subdiaphragmatic free air on upright chest radiographs should have militated strongly against the 'football sign' on the supine abdominal film, but the findings on decubitus radiographs with air on both sides of bowel wall and multiple triangles of air between bowel loops being simulated, added to the confusion. Gastrografin studies excluded a source of perforation.

Radiological signs of free air in the abdomen on supine radiographs have been well documented in the literature, but it is of interest that the 'football sign' (a large loculus of air in the shape of a rugby or soccer ball, situated anteriorly in the abdomen with the string of the football represented by air outlining the falciform ligament), is reported as an uncommon feature in adults[3]. Other signs described include the 'inverted V sign' (with air outlining the lateral umbilical ligaments overlying the sacrum) and a sign with air outlining a full urinary bladder.

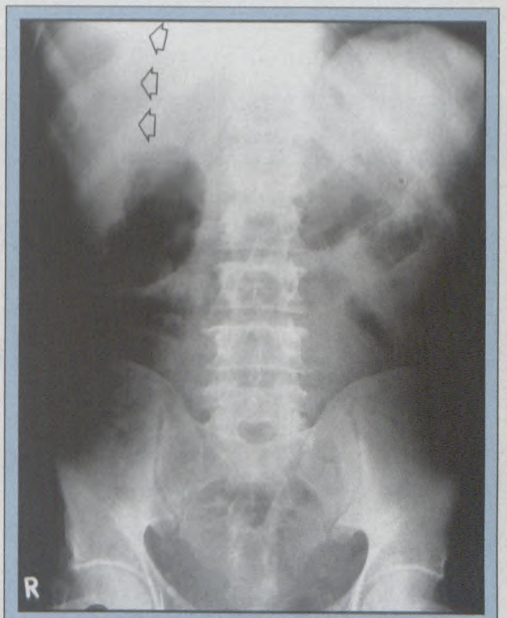

Figure 2: Part of 'football sign' seen overlying liver (arrows) on supine abdominal radiograph, due to intraperitoneal free air which was shown to be subdiaphragmatic in position on chest x-rays. No distended large bowel loops to suggest sigmoid volvulus. The similarity of the 'liver overlap sign' of sigmoid volvulus (Figure 1a) and the 'football sign' of intraperitoneal free air (Figure 2) on supine abdominal radiographs is remarkable.

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In conclusion it must be stated that having seen many cases of free air with a 'football sign' and a few cases of sigmoid volvulus with a 'liver overlap sign', the former diagnosis was favoured. This was also a provisional clinical diagnosis. The fact that free air was conclusively excluded on chest radiographs and a left side down decubitus abdominal radiograph, should have made gastrografin studies of the upper and lower gastrointestinal tract to search for a perforation unnecessary. The gastrografin enema was, however, of considerable benefit in the diagnosis and treatment of the sigmoid volvulus.

If only a supine abdominal radiograph had been available, which might sometimes be the case, it would have been very difficult to distinguish between a ruptured hollow viscus and sigmoid volvulus. Other signs of pneumoperitoneum or sigmoid volvulus also proved to be unhelpful. (In the first case of possible free air they added to the confusion). The clinical features did not aid in differentiating between these two conditions and without further conventional radiographs and contrast studies the diagnosis could not have been made. This case illustrates that neither the 'football sign' nor the 'liver overlap sign' are invariable, infallible indicators.

References

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CASE REPORT

Unusual foreign bodies in the oesophagus

WFC van Gelderen
FFRad(D), Consultant Radiologist

KS Cheng
FRCS(Ed), FRACS, Consultant Surgeon,

Department of Radiology, Wanganui Base Hospital, New Zealand.

A 70 year old man with a known long segment benign stricture of the lower oesophagus, presented again with dysphagia and the stricture was dilated. Subsequent chest radiographs demonstrated signs of a pneumomediastinum.

An Ultravist 300 non-ionic contrast (Schering AG, Germany) swallow demonstrated a localized, contained perforation of the left lower oesophagus. Half a dozen rectangular low attenuation foreign bodies were noted within the area of rupture and within the distal oesophagus (Figure 1).

The patient had not been permitted to have anything by mouth and denied having had anything to eat or drink. On more persistent questioning, however, he admitted to being rather partial to lozenges and had not thought that these would be contraindicated. He had surreptitiously sucked the lozenges one by one in the ward, and subsequently the nucleus of each lozenge, a thin hard square wafer, had found its way down to the oesophagus fully intact in shape, though reduced in size. These wafers were eloquently demonstrated on Ultravist swallow.

The remains of the lozenges were removed at subsequent oesophagoscopy and the patient made an unremarkable recovery with a follow-up contrast swallow demonstrating resolution of the contained rupture.

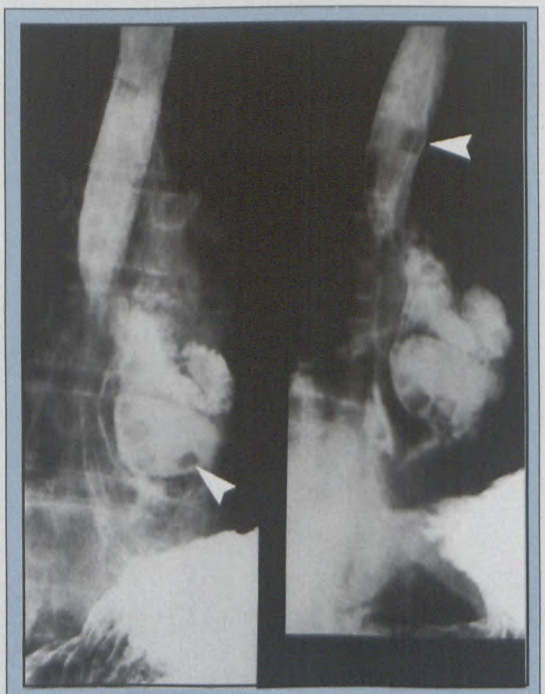

Figure 1: Localized contained rupture left lower oesophagus shown at contrast swallow. Note multiple rectangular low attenuation foreign bodies (arrows) which are the residue of lozenges sucked by the patient over the preceding hours.