

GAS IN THE HEPATO-RENAL SPACE

AN UNUSUAL RADIOLOGICAL SIGN OF PERFORATED APPENDICITIS

I. MOVSAS, M.B., B.CH., D.M.R.D., *Department of Radiology, King Edward VIII Hospital, Durban*

The incidence of pneumoperitoneum in cases of perforated appendicitis is low. Frimann-Dahl¹ did not find a single case of pneumoperitoneum in a series of more than 2,000 such cases. Greenberg² described 2 cases of appendicitis with pneumoperitoneum, and after reviewing the literature found a total of only 10 cases. To these Johnston³ has added a further case of proven appendicitis, with classical radiological signs of free gas in the peritoneal cavity. These figures contrast sharply with the frequent radiological finding of pneumoperitoneum in patients with perforated peptic ulcer.

The presence of gas in Morison's hepato-renal pouch has been described by Pyle.⁴ The gas in this pouch outlines the inferior margin of the liver, and results in a radiological appearance known as the liver edge silhouette sign.⁴ In the following case the unusual finding of the liver edge silhouette sign with acute perforated appendicitis is recorded.

CASE REPORT

R.R., an African male aged 8 years, was admitted on 25 September 1963 complaining of abdominal pain and diarrhoea of 3 days' duration, and dysuria of 1 year's duration.

On examination the temperature was 101°F and the patient was dehydrated and wasted. Generalized abdominal tenderness was present, but guarding or rigidity were not detected. Bowel sounds were present. Rectal examination was normal.

The suspected clinical diagnosis at this stage was typhoid fever.

The leucocyte count was 7,000/cu.mm., and examination of the urine showed the presence of albumin, erythrocytes, leucocytes and ova of *Schistosoma haematobium*. The Widal reaction did not show a significant titre for typhoid, and multiple cultures of blood, stools and urine, failed to reveal the presence of *Bacillus typhosus*.

The patient was given chloromycetin orally for 10 days, but failed to improve and remained febrile. On 2 October considerable abdominal distension and pyrexia developed, suggesting a generalized peritonitis, with the possibility of a perforation not excluded. It was decided to continue with conservative treatment. Parenteral fluids were administered and naso-gastric suction was instituted. The patient improved slightly during the following week.

On 11 October profuse vomiting and increased abdominal distension occurred, suggesting the possibility of a complicating obstruction.

Plain radiographs of the abdomen showed the absence of free gas under the diaphragm. A crescentic translucent shadow was present in the right hypochondrium at the site of the liver edge. This was thought to represent the liver edge silhouette sign. No evidence of intestinal obstruction was noted. There was well-marked calcification of the bladder and right ureter compatible with bilharzia.

On 12 October the vomiting ceased and the patient appeared well hydrated. However, that afternoon a sudden deterioration in the patient's condition took place, and death occurred soon afterwards.

Postmortem examination showed a generalized suppurative peritonitis with large amounts of thick, yellow, offensive pus. The loops of small bowel were congested and matted together by fibrous adhesions. Many adhesions were noted at the inferior liver margin. The appendix was bound down by many adhesions, and its wall was thickened. Pus was present in the appendicular lumen. A macroscopic perforation was not observed.

The bladder showed severe, acute, bilharzial lesions. A bilateral hydronephrosis was present, more marked on the right side, with an associated right pelvic hydronephrosis.

Histological examination confirmed the presence of acute inflammatory changes in the appendix. Pus cells were present in the lumen. Ova of *Schistosoma haematobium* were demonstrated in the appendicular wall, which was thickened and showed fibrotic changes. One of the sections showed a small perforation.

Culture of the pus showed the presence of *B. coli*. Pneumococci and gas-forming organisms were not found.

The pathological diagnosis was:

1. Acute appendicitis with generalized suppurative peritonitis.
2. Bilharziasis of the bladder and appendix.

DISCUSSION

Morison's pouch or the hepato-renal space is a deep recess which is situated above the upper pole of the right kidney. The inferior surface of the liver forms the anterior boundary of the pouch.⁵ The peritoneal covering of the diaphragm and upper pole of the right kidney form the posterior boundary. The superior limit is formed by the posterior layer of the coronary ligament. Inferiorly the pouch is open into the general peritoneal cavity.⁵ Lee

McGregor⁵ points out that the right anterior intraperitoneal compartment, which lies between the anterior surface of the liver and the anterior abdominal wall, communicates with the right posterior intraperitoneal compartment or Morison's pouch around the sharp anterior margin of the liver (Fig. 1).

The liver edge is often seen on a plain radiograph of the abdomen as an oblique line, extending upwards and medially from the lower end of the costal arch towards the epigastrium. In the supine position the liver edge forms the superior limit of Morison's pouch, and gas in the pouch will consequently rise anteriorly and outline the liver edge. A characteristic crescentic translucent shadow is seen at the liver edge in these cases. The superior margin of the crescent is concave and its inferior margin is convex. This radiographic appearance is known as the liver edge silhouette sign⁴ or crescent sign (Fig. 2).

Mann *et al.*⁶ reviewed a large series of perforations into the peritoneal cavity. They found gas localized to Morison's pouch in 6 cases, but did not indicate the lesions responsible for this radiographic appearance. Pyle⁴ described 2 cases of duodenal perforation showing the liver edge silhouette sign, and stressed its rarity. He considers that this appearance is diagnostic of duodenal perforation. The crescent sign has also been observed in a case of perforation of the pelvic colon.⁷ On review of the available literature no further cases were found. As far as I am aware this is the first case of perforated appendicitis showing the liver edge crescent sign.

The close proximity of the duodenum to Morison's pouch (Fig. 1) explains the mode of entry of the gas in some cases of duodenal perforation. However, where the lesions are at some distance from the pouch, for example pelvic colon or appendix, the gas must of necessity first enter the greater sac of the peritoneal cavity and then become localized to Morison's pouch.

The rarity of the liver edge silhouette sign may be due to the fact that there is always a tendency for free gas to

escape from Morison's pouch into the general peritoneal cavity. This is particularly likely to occur in the erect position. It is interesting to note that in the present case the silhouette sign is best shown in the erect (Fig. 2) rather than in the supine position (Fig. 3). This paradoxical finding, contrary to Pyle's⁴ observations, is probably explained by the presence of extensive adhesions at the liver edge, as shown at autopsy. Adhesions at the liver edge (Site A, Fig. 1), tend to seal off Morison's pouch from the right anterior intraperitoneal compartment, and so prevent the usual escape of gas from the pouch in the erect position.

The differential diagnosis of the liver edge silhouette sign includes the other causes of translucent shadows in the right hypochondrium. A small amount of gas in the colon or small intestine, at the site of the liver edge, could on occasion result in difficulty. Consideration of the typical shape and site of the crescent sign, together with delayed films of the abdomen, should allow for differential diagnosis. Gas in an abscess cavity usually shows a fluid level, while gas in the biliary tree or portal system can be distinguished by the typical arborizing pattern and distribution.

The rarity of pneumoperitoneum in cases of perforated appendicitis is a feature of added interest. Johnston⁸ ascribes this low incidence of pneumoperitoneum to the fact that the majority of cases of appendicitis are not examined radiologically. The obliteration of the lumen of the appendix,⁹ which often occurs at an early stage of the disease, is another factor that may explain the absence of free gas in many cases of perforated appendicitis.

CONCLUSION

The liver edge silhouette sign indicates gas in Morison's pouch. The gas may originate from a perforation of the duodenum, appendix, or colon.

SUMMARY

A case of perforated appendicitis with gas in the hepatorenal space of Morison is described.

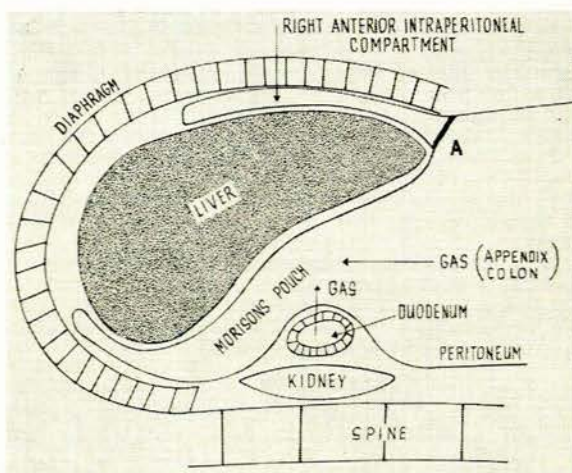


Fig. 1



Fig. 2



Fig. 3

Fig. 1. A diagrammatic representation of the anatomy of Morison's pouch. Adhesions at site A will seal off the right anterior intraperitoneal compartment from Morison's pouch (see text). Fig. 2. Erect view of abdomen. The arrow points to the liver edge silhouette sign. Fig. 3. Supine view of abdomen. The liver edge silhouette sign is not as well shown as on the erect film. Calcification in the bladder and right ureter is demonstrated.

The mechanism of production of the liver edge crescent sign is discussed.

The rarity of the liver edge silhouette sign is stressed. The appearance may be due to a perforation of the duodenum, appendix or colon.

Thanks are due to Prof. N. Sacks, Head of the Department of Radiology, University of Natal Medical School, for helpful criticism and advice; and to Dr. H. R. J. Wannenburg, Medical Superintendent, King Edward VIII Hospital, for permission to publish.

REFERENCES

1. Frimann-Dahl, J. (1960): *Roentgen Examinations in Acute Abdominal Diseases*, 2nd ed., p. 377. Springfield, Ill.: Charles C. Thomas.
2. Greenberg, B. E. (1961): *Radiology*, **77**, 248.
3. Johnston, G. (1964): *Brit. J. Radiol.*, **37**, 76.
4. Pyle, R. (1963): *Ibid.*, **36**, 503.
5. McGregor, A. L. (1950): *A Synopsis of Surgical Anatomy*, 5th ed., p. 590. Bristol: John Wright.
6. Mann, L. S., Kirsh, I. E., Eisen, J. and Familiaro, J. E. (1956): *Arch. Surg.*, **72**, 450.
7. Jackson, D. M. (1963): *Brit. J. Radiol.*, **36**, 783.
8. Collins, D. C. (1955): *Surg. Gynec. Obstet.*, **101**, 437.