Proximal Small Bowel Infarction Associated with Portal Venous Gas

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ABSTRACT

Clostridium perfiringens may cause myonecrosis (i.e. gas gangrene), acute food poisoning or necrotic enteritis (e.g. enteritis necroticans or Pig Bel). We describe a case of enteritis necroticans in a 33 year old man with acute myeloid leukaemia. He presented with an acute abdomen, diarrhoea and pancytopaenia and extensive accumulation of gas in the intrahepatic and extrahepatic portal veins. Despite urgent resuscitation he died shortly after arrival in the Intensive Care Unit.

Treatment of enteritis necroticans requires urgent surgery to remove dead bowel and in adults intravenous penicillin (1g 2-hourly) and metronidazole (500 mg 8-hourly) or clindamycin (600 mg 6-hourly). While antibiotics may also reduce toxin formation, beta toxoid has not been found to be of benefit in established disease. (**Critical Care and Resuscitation 1999; 1: 184-186**)

Key words: Clostridium perfiringens, Enteritis necroticans, portal venous gas, pneumatosis intestinalis, enterocolitis

A young man with acute myeloid leukaemia was admitted to our intensive care unit in shock with an acute abdomen and portal venous gas on plain abdominal X-ray.

CASE REPORT

A 33 year old man with acute myeloid leukaemia (subtype M2) was admitted to hospital with colicky abdominal pain associated with diarrhoea and pancytopenia. The complete blood count revealed a haemoglobin of 95 g/L, white cell count of 0.2 x 10^9/1 and platelet count of 20 x 10^9/L. He had completed consolidation chemotherapy with idarubicin, cytarabine and VP16 ten days previously. Over the following 24 hours his condition deteriorated with the development of an acute abdomen and hypotension associated with torrential haematemesis and rectal bleeding.

He was transferred to the intensive care unit where a plain erect abdominal X-ray (Figure 1) demonstrated extensive accumulation of gas in the intrahepatic and extrahepatic portal and splenic veins (arrows). In addition, dilated and oedematous small bowel with pneumatosis intestinalis was present (arrowheads). Despite aggressive resuscitation efforts, he died shortly after arrival.

At post mortem he was found to have haemorrhagic infarction of the duodenum and proximal jejunum. Gas was found in the omentum, mesenteric tissues, fatty tissues around the pancreas and in the intrahepatic and extrahepatic portal and splenic veins. Histological sections of the jejunum demonstrated gram positive rods consistent with a clostridial species in the wall of the jejunum. Blood and stool cultures were negative.

DISCUSSION

Portal venous gas may occur in many disorders some of which have a benign course (e.g. gastrointestinal ileus, trauma, laparoscopy, seizure, hyperbaric decompression) and others which have a high mortality rate and are usually associated with an intra-abdominal infection by a gas forming organism (e.g. bowel infarction, diverticulitis, hepatic abscess, peritoneal cavity abscess).[1] While *Clostridium perfiringens* is a common gas forming organism, gas is

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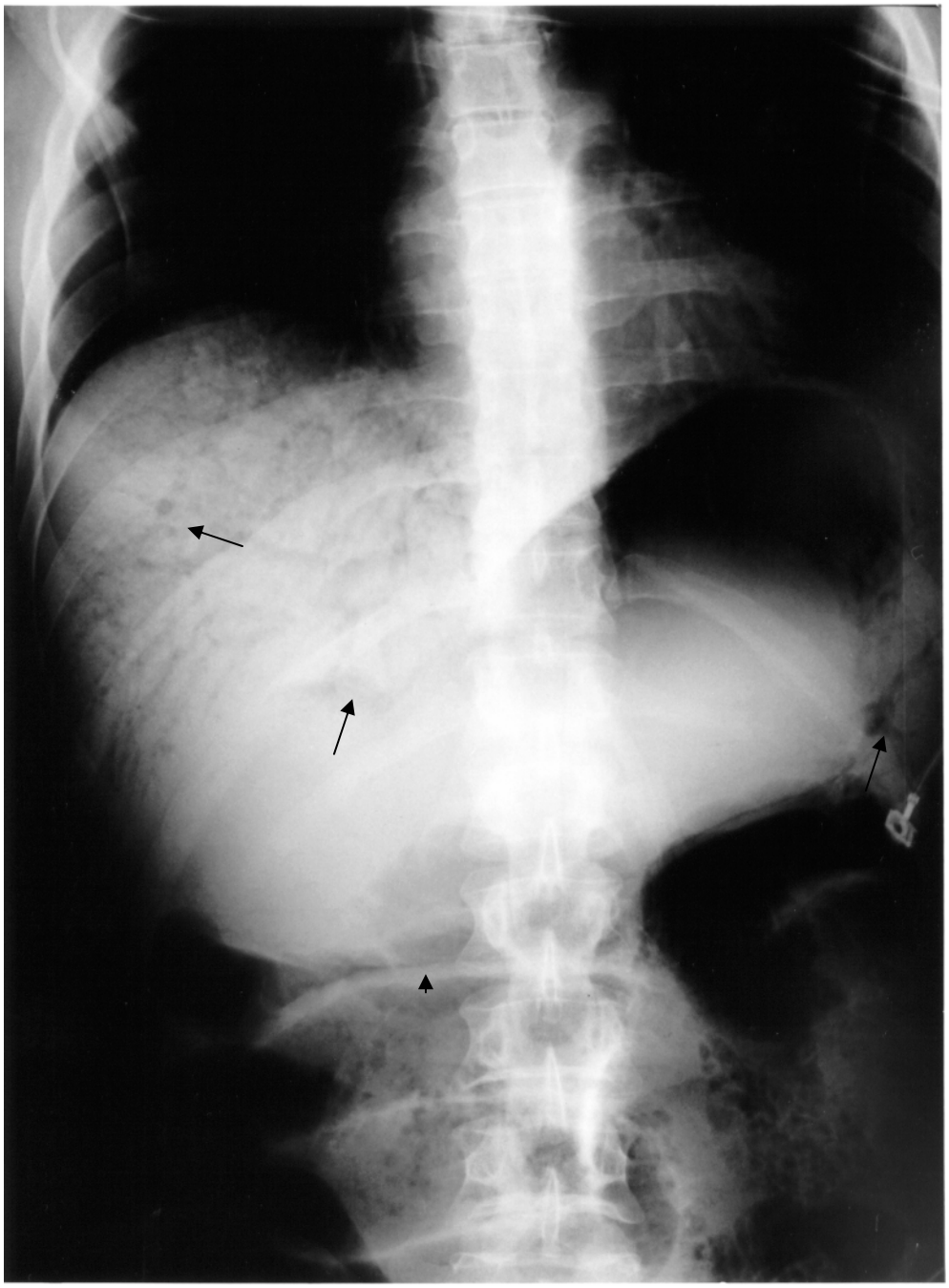

Figure 1. Plain erect abdominal X-ray shows extensive accumulation of gas in the intrahepatic and extrahepatic portal and splenic veins (arrows), and dilated and oedematous small bowel associated with pneumatosis intestinalis (arrowheads).

not a pathognomonic of *Clostridium perfiringens* disease. Other gas forming organisms include, *Escherischia coli*, *Klebsiella*, Enterobacter sp., anaerobic streptococci, *Bacteroides fragilis, Proteus mirabilis*, *Enterococcus faecalis*, and *Pseudomonas aeruginosa*.[2]

Clostridium perfiringens is commonly found in normal colonic flora and in the presence of certain conditions can cause myonecrosis (gas gangrene), food poisoning (with epigastric pain, nausea and diarrhoea) as well as a necrotising enterocolitis (i.e. enteritis necroticans). Enteritis necroticans, sometimes known as Pig Bel, is the likely cause of this patient's illness. It is due to a gas producing organism *Clostridium*

perfringens type C. The disease is well known in the highlands of Papua New Guinea, often following ingestion of a pork meal, in conjunction with trypsin inhibitors (e.g. in sweet potatoes) where it is a major cause of death in children, but is rarely diagnosed in developed countries.[3]

Other Clostridial species have been associated with gut necrosis and gas in the tissues. *Clostridium septicum* may produce a necrotizing enterocolitis (Typhlitis). Typically it occurs in neutropenic patients, with haemorrhagic infarction involving the caecum and varying lengths of adjacent colon or ileum rather than the proximal small bowel.[4,5]

Enteritis necroticans typically occurs following the consumption of a meat meal contaminated with *Clostridium perfringens*.[6] The clinical illness begins on the day after the initiating meal, with abdominal pain, vomiting and bloody diarrhoea. At operation or post mortem, in addition to a patchy infarction of the proximal small bowel, gaseous collections in the submucosae, subserosa, mesenterium, and regional lymph nodes are found.[7]

Clostridium perfringens type C produces a beta toxin which is essential for the pathogenesis of the disease. The beta toxin is extremely sensitive to proteolytic inactivation in the gut and therefore reduced gut proteolytic activity is associated with increased risk of the disease.[3] As it is a toxaemic illness, antibiotics may be of limited value, although in adults penicillin (1 g 2-hourly) and metronidazole (500 mg 8-hourly) or clindamycin (600 mg 6-hourly) are recommended, as they may reduce ongoing toxin production. While immunisation with *Clostridium perfiringens* beta toxoid may protect children from developing Pig Bel, the beta antitoxin has not been found to be of value in established disease. Surgery to remove dead gut is the essential intervention.[6]

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