Hemorrhagic shock caused by sigmoid colon volvulus: An autopsy case

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Summary

Background: Many reports have described sigmoid volvulus, but fatal hemorrhagic shock resulting from the rupture of the involved artery has not been reported as a complication of a sigmoid volvulus.

Case Report: A 71-year-old man with slight abdominal pain and obstipation in hypotension died at a nursing home without seeing a doctor. At autopsy, a mesenteric hematoma and hemoperitoneum was observed with approximately 1,000 ml of blood in the abdominal cavity. The sigmoid colon and the mesentery were twisted at an adhesion site of a sigmoid colon to an ileum, and the condition was determined to be a sigmoid volvulus. The volvulus was observed to be loosened. The inferior mesenteric artery was incorporated into the twisted part of the mesentery, but remained patent, and its peripheral branch near the hematoma ruptured without histological abnormality.

Conclusions: Since ischemic-reperfusion injury occurs with a temporarily occluded artery, the acute re-loading of blood flow may injure the distal vessels after spontaneous reduction of compression by loosening of the volvulus.

key words: sigmoid volvulus • complication • mesenteric hemorrhage • hemoperitoneum • ischemic-reperfusion injury

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BACKGROUND

A colon obstruction may result in complications such as dehydration, shock and septic toxemia, all of which are life-threatening [1,2]. A sigmoid colon volvulus may cause ischemic changes in the large intestine through compression of the mesenteric vessels and reduction of the blood supply, which result in necrosis [2]. It is important for the patient to receive an emergent surgical decompression with the replacements of fluids and electrolytes, and the administration of antibiotics [2–4]. However, in the case of a low grade obstruction with no sign of abdominal gangrene or peritonitis, non-operative treatments such as rectal tube insertion and sigmoidoscopic decompression are effective with few fatal complications [2,5–7]. In this report, we describe an atypical case of a low grade sigmoid volvulus that resulted in death from hemorrhagic shock induced by the rupture of an inferior mesenteric artery branch following non-operative treatment.

CASE REPORT

The case was a male (71 years old, 45 kg in weight) who was diagnosed with hypertension and medicated for depression. He showed no symptoms and had no history of abdominal disorders or abdominal surgeries. At 12 hours before death at a nursing home, the man felt a slight abdominal pain and obstipation, with pallid and frigid extremities, but he did not receive any medical examination or medications. 4 hours before the death, his extremities were extremely frigid and showed severe pallor. His systolic blood pressure was 76 mmHg. An intravenous drip injection of saline was started by a night nurse. At several hours after the injection, the victim was found in cardiopulmonary arrest, and attempts at resuscitation were immediately started by the nurse. At approximately 15 minutes after the arrest, the victim was confirmed dead by paramedics. He had received no medical examinations by a doctor since the clinical symptoms appeared.

At autopsy, the skin of the whole body had a mild or moderate pallor. No surgical scars were observed on the abdomen. A heavy massive adhesion between the sigmoid colon and ileum was observed (Figure 1). One end of the adhesion on the sigmoid colon was located approximately 60 cm proximal to the anus, and the other end of the adhesion on the ileum was located approximately 30 cm proximal to ileocecal junction. The sigmoid colon was twisted together with the adherent mesentery at the adhesion site. The sigmoid colon and descending colon around the adhesion was slightly dilated. The observations are consistent with a sigmoid volvulus. The volvulus was not constricted and included the inferior mesenteric artery. The artery was running into the twisted part of mesentery, and was determined to be patent by the easy insertion of a probe (Figure 2). In the mesentery, an approximately 500 g hematoma and a perforated mesentery membrane were observed around the dilated descending colon. In the abdominal cavity, 500 ml of hemoperitoneum was observed. Histologically, the serosa was strongly fibrous, degenerated but anatomical anomalies were not observed at the adhesion. The engorgement and hemorrhage were observed at the dilated colon wall, although very little necrosis was observed. The ruptured vessel was a peripheral branch of the involved inferior mesenteric artery (Figure 3). No pathological abnormalities such as arteriosclerosis, aneurysm or arteritis that may have resulted in the arteriorrhesis were observed. We speculate that the victim died from hemorrhagic shock induced by rupture of the peripheral branch of the twisted inferior mesenteric artery.

DISCUSSION

Approximately 60 to 70% of all cases of large bowel obstruction are due to carcinoma of the colon [2]. Volvulus at the

**Figure 1.** A sigmoid colon with mesentery was twisted on the axis of an adhesion of sigmoid colon to ileum. The white arrowhead indicates the adhesion axis. The adhered sigmoid colon was located approximately 60 cm proximal to the anus, and the ileum was located approximately 30 cm proximal to the ileocecum. The descending and sigmoid colon around the twisted portion was slightly dilated, and a sigmoid volvulus was recognized. Approximately 500 g of hematoma was observed in the mesentery around the dilated descending colon.

**Figure 2.** The lesions, including the sigmoid colon volvulus, the hemorrhagic descending colon, and adhesive ileum are shown. The twisted sigmoid volvulus is turned over as compared with Figure 1. The sigmoid volvulus was loosened, and the inferior mesenteric artery running into the twisted part of mesentery was shown to be patent with easy probe insertion. The root of the mesenteric artery is indicated by the large black arrow, and the tip of the inserted probe also appeared there. A hematoma and a perforated membrane are observed at the mesentery around the dilated descending colon (indicated by small white arrows).
sigmoid colon is the second most common cause of large bowel obstruction, and accounts for 5 to 10% of all cases [2]. Previous abdominal surgery is the most common cause of intestinal volvulus [8], although anatomical anomalies, such as diverticulum and hernia, may cause intestinal volvulus. In this case, no previous abdominal surgery was reported and no anatomical anomalies were confirmed at autopsy. The adhesion between the sigmoid colon and an ileum became an axis of the sigmoid colon volvulus, which was highly fibrous and degenerated on histological examination. Past partial peritonitis may have been the cause of the adhesion.

In the case of colon obstruction, bacteria and bacterial products pass through the damaged bowel wall and enter systemic circulation, which may induce septic shock state [1,2]. In this case, the victim fell into a shock state after the appearance of clinical symptoms such as constipation, abdominal distention and abdominal pain, which are known as distinctive findings of sigmoid colon volvulus [4,7]. During the early stage of septic shock, vasodilatory mediators predominate and present warm extremities, so-called “warm shock” to patient [9]. However, the extremities of this case showed pallor and were frigid after appearance of the symptoms. The victim was in “cold shock”. Hypersecretion of the digestive fluid and hypoaosorption of the damaged intestinal wall have been described to cause fluid loss and bring severe dehydration to the victim of large bowel obstruction [2]. Dehydration following sigmoid colon volvulus may induce hypovolemic shock, which corresponds to the “cold shock” state of this case. The hematoma and hemoperitoneum amounted to 1,000ml in the abdominal cavity of the present victim. The ruptured vessel was the peripheral branch of the inferior mesenteric artery, which ran into the twisted part of the mesentery. Pathological abnormalities, such as arteriosclerosis, aneurysm and arteritis, was not observed at the ruptured artery. Elastica van Gieson staining. Bar=500 µm.

To our knowledge, fatal hemorrhagic shock has not been described in a case of intestinal volvulus. In intestinal volvulus, compression of the mesenteric vessels may occur very early [2], followed by blood flow decrease in the distal vessels. When the blood outflow from the venous side is interrupted by volvulus, engorgement and frank hemorrhage into bowel lumen or wall may appear [10]. When the blood supply to arterial side is interrupted due to vasospasm or mechanical obstruction of the mesenteric arteries, both the intestinal wall and arterial wall fall into a relative tissue anoxia [2]. In this case, ischemic changes were scarcely observed in the dilated intestinal wall, though engorgement and frank hemorrhage were confirmed probably due to a reduction in venous blood outflow. The low grade twist of mesentery may have caused a brief and mild decrease in the blood flow of the inferior mesenteric artery, resulting in fragility of the arterial wall. Arterial patency by spontaneous loosening of the volvulus in this case may have caused the acute recovery of arterial blood flow and blood pressure. However, the reloading of blood flow may eventually result in the rupture of the fragile arterial wall, similar to an ischemic-reperfusion injury of a temporary occluded artery. Furthermore, persistent intramesenteric bleeding may enlarge the hematoma, perforate the mesenteric membrane, and result in the hemoperitoneum observed in this case.

The most common symptoms of sigmoid volvulus are described as abdominal pain, obstipation, vomiting and abdominal distention [4,7]. When a sigmoid volvulus is suspected, the diagnostic study is performed using a plain abdominal radiograph data such as “coffee bean” or “omega” sign of the dilated and twisted sigmoid colon [5,8,11]. Treatment of large bowel obstruction is designed to relieve colonic distention with treatment for dehydration, shock and toxemia [2]. The definitive treatment is surgical decompression of the obstructed bowel [3,5,6,11]. In the case of a low grade obstruction with no sign of bowel gangrene or peritonitis, as in this case, it is sufficient to relieve the obstruction by non-operative treatments such as rectal tube insertion and sigmoidoscopy decompression without significant complications [5–7]. However, a fatal mesenteric hemorrhage can be induced by the rupture of twisted vessels following spontaneous sigmoid volvulus improvement.

Conclusions

Many reports have demonstrated the cause, diagnosis, treatments and complications of colon obstruction. This is the first report on the fatal complication of hemorrhagic shock following a sigmoid colon volvulus.

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