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CASE REPORT

Rupture of sigmoid colon caused by compressed air

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Abstract

Compressed air has been generally used since the beginning of the 20th century for various applications. However, rupture of the colon caused by compressed air is uncommon. We report a case of pneumatic rupture of the sigmoid colon. The patient was admitted to the emergency room complaining of abdominal pain and distention. His colleague triggered a compressed air nozzle against his anus as a practical joke 2 h previously. On arrival, his pulse rate was 126 beats/min, respiratory rate was 42 breaths/min and blood pressure was 86/54 mmHg. Physical examination revealed peritoneal irritation and the abdomen was markedly distended. Computed tomography of the abdomen showed a large volume of air in the abdominal cavity. Peritoneocentesis was performed to relieve the tension pneumoperitoneum. Emergency laparotomy was done after controlling shock. Laparotomy revealed a 2-cm perforation in the sigmoid colon. The perforation was sutured and temporary ileostomy was performed as well as thorough drainage and irrigation of the abdominopelvic cavity. Reversal of ileostomy was performed successfully after 3 mo. Follow-up was uneventful. We also present a brief literature review.

Key words: Colon; Rectum; Colon rupture; Intestinal perforation; Compressed air

Core tip: Rupture of the sigmoid colon caused by compressed air is uncommon. Most of the injuries occur around the junction of the rectum and sigmoid colon. Abdominal distention and pain develop abruptly, and if colon perforation also occurs, symptoms of peritoneal irritation are also present. The diagnosis is not difficult if the patient has a history of abdominal pain and distention after exposure to compressed air. The management of pneumatic colon injury has two aspects: tension pneumoperitoneum and colon injury.

Moreover, in our opinion, prevention and treatment of shock is essential. The prognosis has been favorable in recent years.

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INTRODUCTION

Compressed air has been used in industry since the beginning of the 20th century for various applications. However, rupture of the colon caused by compressed air is uncommon. Pneumatic colorectal injury occurs due to pranks or dusting clothes with compressed air. This injury can occur without inserting the air hose into the anus. We encountered a similar case that needed emergency surgical intervention.

CASE REPORT

A 36-year-old man was admitted to the emergency room complaining of abdominal pain and distention. About 2 h before his arrival to hospital a colleague placed, as means of a practical joke, a compressed air nozzle 10 cm distant from his anus. On arrival, his pulse rate was 126 beats/min, respiratory rate was 42 breaths/min and blood pressure was 86/54 mmHg. Physical examination revealed signs of peritoneal irritation and the abdomen was markedly distended like a large ball. X-rays taken in the supine showed a large volume of air in the abdominal cavity and elevated diaphragm (Figure 1). Urgent computed tomography showed a large volume of air under the diaphragm (Figure 2A), and in the abdominal (Figure 2B) and pelvic cavity (Figure 2C). Arterial blood gas analysis showed pH 7.40, partial pressure of oxygen 70 mmHg, partial pressure of CO_2 38 mmHg, and oxygen saturation 88%. Other laboratory results were within normal limits, except white blood cell count of 11.2×10^9/L.

A diagnosis of perforation of the gastrointestinal tract and acute diffuse secondary peritonitis was made. A nasogastric tube was inserted and peritoneocentesis was done with a 23-gauge needle to relieve the tension within the pneumoperitoneum. Emergency laparotomy was done after controlling shock. A perforation approximately 20 mm long was found in the distal sigmoid. The perforation was sutured and temporary ileostomy was performed as well as thorough drainage and irrigation of the abdominopelvic cavity. Considering rupture of the sigmoid colon and intra-abdominal fecal contamination, ileostomy was performed to prevent intestinal fistula. Reversal of ileostomy was done successfully after 3 mo. Follow-up was uneventful 1 year later.

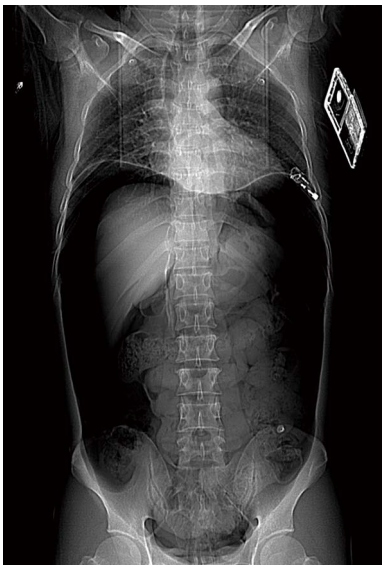

Figure 1 X-rays taken in the supine position, showing a large volume of air in the abdominal cavity, and elevated diaphragm.

DISCUSSION

As the use of compressed air in industry has increased, so has the risk of barotrauma. Colorectal rupture due to compressed air mostly occurs as a result of triggering a compressed air nozzle against the anus as a practical joke, or the practice of dusting clothes with compressed air[1]. A PubMed search was performed using key words "colon" and "compressed air", and only English language articles were collected. Eight cases of colorectal injury (including our case) caused by compressed air were retrieved between 1994 and 2015 (Table 1).

The normal colon can withstand high intraluminal pressures before rupture occurs. When pressure increases progressively, the serosal layer is the first to split, followed by the muscle, then the mucosa[2-4]. The average pressure needed to cause full thickness tearing of the human gastrointestinal tract is 0.29 kg/cm^2[3]. Gaseous jets are elastic and expand in all directions, adapting to their surroundings, bending and twisting, and causing eddy currents[1]. So, colorectal injury may occur when the nozzle is merely placed in the vicinity of the anus, even when clothes are worn[1,2,5]. As the anal canal and distal rectum are well supported by external structures, the rectosigmoid region, with the firm lateral support of the rectum, is the first part of the colon to be struck by a column of air[6,7]. Therefore, most of the injuries occur around the junction of the rectum and sigmoid colon[1,3,5,6]. Colon perforation can occur singularly or multiply at any site of the colon[3,6].

Clinical manifestations vary, depending on the

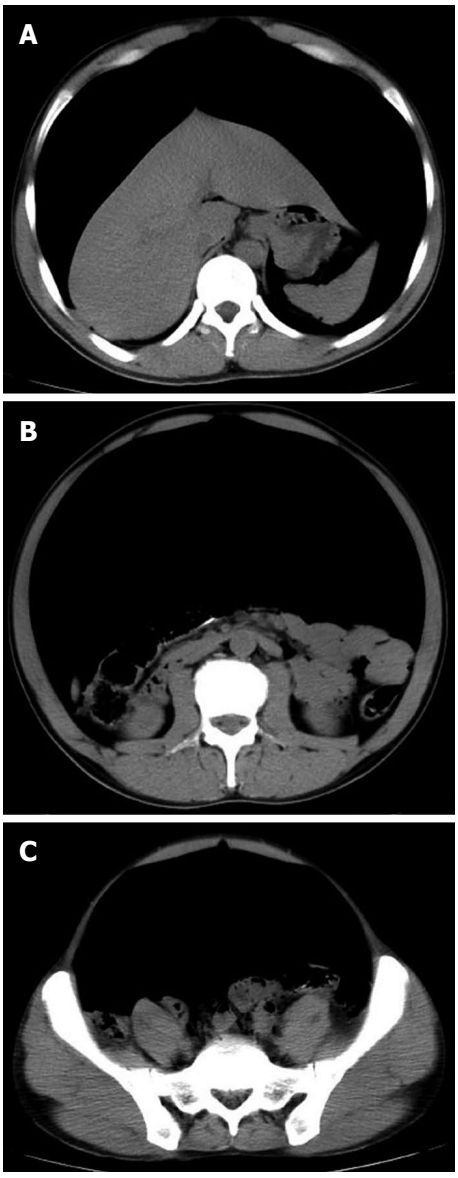

Figure 2 Computed tomography scan showing a large volume of air under the diaphragm (A), a large volume of air in the abdominal cavity (B) and in the pelvic cavity (C).

extent of colonic injury. Abdominal distention and pain develop abruptly, and if colon perforation also occurs, symptoms of peritoneal irritation are also present[3]. The enormous ballooning of the abdomen and respiratory distress due to tension within the pneumoperitoneum are characteristics[3,7]. High intraperitoneal air pressure can compress the inferior vena cava and cause obstructive shock. Feces in the peritoneal cavity may cause septic shock. Barotrauma may cause traumatic shock. In addition, pneumothorax and rhabdomyolysis may be present[2,8].

The diagnosis is not difficult if the patient has a history of abdominal pain and distention after exposure to compressed air. However, a history in these cases may be obscure. Some patients may withhold information and attempt to conceal the facts, trying to protect the guilty party or due to embarrassment[1,4,5]. The uniformity of the tympany over the entire abdomen is considered diagnostic[1]. Computed tomography of the abdomen showing a large volume of air in the abdominal cavity will confirm the diagnosis. Although most cases are diagnosed on the initial visit, some cases of delayed colonic rupture have been occasionally reported[6].

Table 1 Eight cases of colorectal rupture caused by compressed air between 1994 and 2015

Case	First author	Year	Sex	Age (yr)	Site of perforation	Outcome
1	Kinjyo	1994	Male	23	Hepatic flexure of colon	Alive
2	Suh	1996	Female	58	Sigmoid colon	Alive
3	Suh	1996	Male	55	Sigmoid colon	Alive
4	Kim	2000	Male	33	Sigmoid colon	Alive
5	Zunzunegui	2002	Male	29	Sigmoid colon	Alive
6	Pahwa	2012	Male	30	Sigmoid colon	Alive
7	Sy	2014	Male	4	Transverse colon	Alive
8	Yin[1]	2015	Male	36	Sigmoid colon	Alive

[1]Current case.

The management of pneumatic colon injury has two aspects: tension pneumoperitoneum and colon injury[3]. Moreover, in our opinion, prevention and treatment of shock are essential. Abdominal paracentesis with a needle is a simple and useful method to relieve the tension within the pneumoperitoneum and respiratory distress, which should be performed as quickly as possible[1-3,5]. Early emergency laparotomy, after controlling shock, is recommended as soon as the diagnosis of full-thickness perforation is made[1,6,7]. Primary repair or resection and anastomosis with or without diversion should be performed[1,3,9]. Thorough drainage and irrigation of the contaminated abdominopelvic cavity is advisable. Careful observation following surgery is important since rupture of the colon may have delayed presentation[3,4,6]. The convalescence of some patients may be complicated by marked psychological upset. Therefore, psychotherapy is necessary and should be kept in mind.

The prognosis is favorable and none of the eight patients (including our case) retrieved from the PubMed search between 1994 and 2015 died.

In conclusion, rupture of the sigmoid colon caused by compressed air is uncommon. Early emergency laparotomy, after controlling shock, is recommended as soon as the diagnosis of full-thickness rupture is made.

COMMENTS

Case characteristics

A 36-year-old man presented with abdominal pain and distention.

Clinical diagnosis

Physical examination revealed signs of peritoneal irritation and the abdomen was markedly distended like a large ball.

Differential diagnosis
Differential diagnoses include common acute abdomen.

Laboratory diagnosis
Arterial blood gas analysis showed pH 7.40, partial pressure of oxygen 70 mmHg, partial pressure of CO_2 38 mmHg and oxygen saturation 88%. Other laboratory results were within normal limits, except white blood cell count of 11.2×10^9/L.

Imaging diagnosis
Urgent computed tomography showed a large volume of air under the diaphragm, and in the abdominopelvic cavity.

Pathological diagnosis
There was no specimen for pathological diagnosis.

Treatment
The perforation was sutured and temporary ileostomy was performed, as well as thorough drainage and irrigation of the abdominopelvic cavity.

Related reports
Eight cases of colorectal injury (including our case) caused by compressed air were retrieved between 1994 and 2015.

Term explanation
Colorectal rupture due to compressed air mostly occurs as a result of triggering a compressed air nozzle against the anus as a practical joke, or the practice of dusting clothes with compressed air.

Experiences and lessons
Early emergency laparotomy, after controlling shock, is recommended as soon as the diagnosis of full-thickness rupture is made.

Peer-review
This is a short contribution in the form of a case report, which introduces an interesting rare case of rupture of sigmoid colon.

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