

Non Iatrogenic Colonic Barotrauma- A Case Report

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ABSTRACT

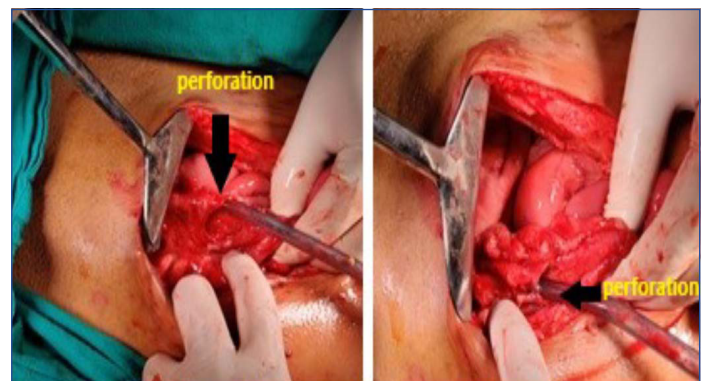
Barotrauma is injury caused by high pressure. Colonic barotrauma can range from only mucosal injury to multiple perforations. Most common cause of colonic barotrauma is due to air insufflation during colonoscopy. Here, we are presenting the case of a 20-year-old young male working in a wheat flour packaging factory. He suffered sigmoid colon perforation as a result of non iatrogenic barotrauma. Sigmoid perforation was closed in two layers with diversion loop ileostomy created and seromuscular injuries repaired. Ileostomy was closed after three months. In this case, high pressure pipe was not inserted inside but directed from a distance. Machines used in the industries deliver compressed air at much higher pressure than the one required to perforate intestine. Such high pressure along with funnel like configuration of thighs, buttocks and perineum facilitates easy entry of air in the colon. Air can enter through anus even if the air hose is kept near it for few seconds without actually inserting inside. Thus, it is important to make workers aware of hazardous consequences of the machines used.

Keywords: Colon, Distance, Perforation, Pneumoperitonium

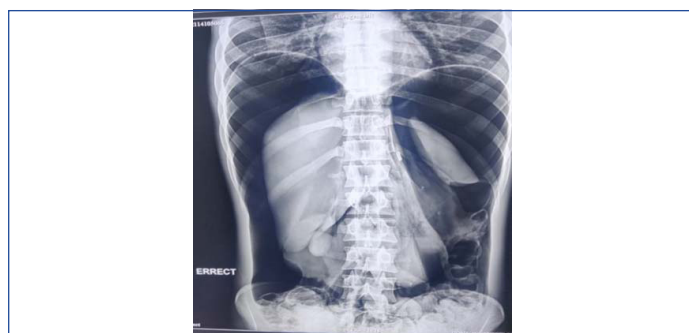
CASE REPORT

A 20-year-old male working in a wheat flour packaging factory presented in Surgery Emergency with complaints of pain in abdomen, nausea and distension of abdomen since three hours. He gave history that while at work, a friend put high pressure air pipe near his anal region for few seconds. Immediately following it, patient developed pain in abdomen. He felt like passing stool but was not relieved.

On examination patient had pulse of 110 per minute along with difficulty in breathing. He was sweating, abdomen was tensely distended, bowel sounds were absent. On per rectal examination rectum was collapsed, there were no signs of any external injury or bleeding. X-Ray of abdomen revealed gross pneumoperitonium [Table/Fig-1]. After informed consent laparotomy was performed. On exploration there was a 5 cm long perforation in sigmoid colon. Multiple serosal tears extending from rectosigmoid upto transverse colon were found [Table/Fig-2]. Perforation was closed in two layers and diversion loop ileostomy was made. Ileostomy was closed three months later after confirming distal patency. Patient was discharged after seven days and was doing well at one month follow-up.



[Table/Fig-2]: Intraoperative photographs showing sigmoid Operforation and big serosal tear.



[Table/Fig-1]: Plain X-Ray abdomen erect showing gross pneumoperitonium.

DISCUSSION

Barotrauma is an injury caused due to high pressure. Colon barotrauma is colonic injury caused by elevated intra luminal pressure [1]. Most commonly colonic barotrauma is iatrogenic, occurring during a colonoscopy procedure [2]. Its incidence is reported as 0.1 to 0.5%. According to the law of Laplace, the wall tension in an elastic tubular/spherical structure is directly proportional to

the intramural pressure and the diameter of that structure. Thus, cecum having largest diameter in colon is most commonly affected part in barotrauma during colonoscopy procedure [3]. Iatrogenic colorectal pressure injuries may range from milder variety i.e., “Cat scratch” colon (bright erythematous linear marks in colonic mucosa resembling scratches) to severe colonic perforations [2,4].

First case of colorectal injury by compressed air due to insertion of the air hose directly into the rectum was reported by Stone GW in 1904 [5]. Despite being rare, this mode of injury is becoming important as high pressure compressed air is being increasingly used in many industries. A blow gun dust cleaner is a commonly used pneumatic tool in the industries [6]. Non cautious use of these tools can lead to serious life threatening injuries to the workers. The mean resting anal pressure in adults is 0.84 kg/cm² [7]. However, the air pressure in most compressed air equipment is many times higher and it easily overcomes the barrier of anal sphincter. The compressed air can even penetrate barriers, such as clothes. Burt CAV studied the relationship between air pressure and intestinal rupture in 1931. He found that mucosa was the strongest of the four layers of the intestinal wall. It was able to withstand much higher pressure than muscle and serosa before rupturing. In compressed air equipments air pressure is much higher (100 psi) than the bursting pressure of intestine (~4 psi) [8].

Initially, the authors found it unbelievable when the patient told that injury occurred while his friend jokingly brought high pressure pipe

near his buttocks with his clothes on, without actually inserting it inside. Despite being asked multiple times patient persisted with this history. However, surprisingly on reviewing literature we found that in very few cases the injuries occurred while the air hose was held outside of the patient's clothing, at a distance from the anus. Al-Ozaibi L and Al-Jarrah Z reported case of a 27-year-old male working at a tyre shop, who suffered colorectal injury when a colleague directed compressed air towards his anus from distance for cleaning his clothes on his insistence [9]. Fortunately, this patient did not suffer bowel perforation and was managed conservatively. Rastogi S et al., reported case of a 35-year-old male working in rice mill industry. He suffered colonic perforation due to compressed air jet being directed towards his anus by a colleague jokingly [10]. Zunzunegui RG et al., reported a similar case [11]. These cases suggest that jet of air can enter through the anus even while it is covered with clothes and air jet not accurately directed at it. It has been suggested that funnel like anatomical configuration of thighs, buttocks and perineum, allow easy delivery of compressed air into the anal orifice. Clothes do not alter the effect of compressed air [11].

In reported literature, most commonly perforated area following insufflation of compressed air is rectosigmoid junction. While injury of ascending colon, hepatic flexure, and transverse colon is less common, small intestine injury has been rarely reported [11]. Anal canal and descending rectum lie deep inside pelvis and are well supported by muscles and other structures. Antimesenteric border of the rectosigmoid is the first part to be hit by column of compressed air. It is one of the reasons for it being the most common site of perforation. The sudden high velocity insufflation of air creates extreme shear force at the point of maximal fixation. Bilateral fixation of rectosigmoid junction limiting its mobility is another contributory factor for high propensity of this part to perforate following compressed air insufflation [12,13]. As per a study by Burt CAV, the order of resistant strength to intraluminal pressure were rectum, sigmoid colon, ileum, oesophagus, jejunum, transverse colon, caecum and stomach in order [8]. Spectrum of lesions resulting from pneumatic insufflations include serosal haemorrhage, lacerations of the serosa and muscular coat or complete rupture of the bowel through the serosa, muscular coat and mucous membrane [6]. In literature cases have been reported which were managed conservatively as injuries were only seromuscular without any perforation [9].

Clinical manifestations depend on intraluminal pressure, flow and velocity of compressed air as well as type of injury to the bowel. Patients can present with tension pneumoperitoneum.

Vena cava compression can decrease venous return to the heart leading to hypotension and circulatory collapse. There can be single

or multiple perforations [13]. Colonic perforation leads to rapid abdominal distension. Signs of peritonism may also be present.

Diaphragmatic pressure due to tension pneumoperitoneum can cause respiratory distress. Resulting hyperventilation could result in mild to moderate respiratory alkalosis. Migration of air under pressure through the oesophageal hiatus can give rise to pneumomediastinum, pneumothorax, and extensive subcutaneous emphysema [14].

CONCLUSION(S)

Colorectal injury by compressed air is not frequent in spite of the increased and widespread use of compressed air in modern life. Despite being rare, it is important that the workers at such places should be made aware that ignorant or purposeful use of compressed air close to the perineum can lead to disastrous colorectal injuries.

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