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General Surgery

CASE REPORT ON SIGMOID COLON PERFORATION DUE TO SEVERE BAROTRAUMA

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ABSTRACT Colon barotrauma can be mostly caused by elevated intra-luminal pressure. Air insufflation during colonoscopy procedure is the most common cause of iatrogenic colon barotrauma. Few cases of multiple perforations of colon caused by non-iatrogenic barotrauma are noted in the literature. We presently report a case of non-iatrogenic colon barotrauma caused by industrial air insufflator in a 46 year old male, working as labourer at rice mill. Patient had an accidental entry of air with hose of industrial air insufflator pump to anal region with the pressure set at the maximum. Emergency laparotomy was done. Perforation of sigmoid colon, multiple linear seromuscular tears proximal to perforation, faecal peritonitis were noted. Resection of sigmoid colon perforation with end to end anastomosis was done. A descending colon loop colostomy was then fashioned. Post operative period was uneventful and patient was discharged after 10 days with regular follow up. After 6 weeks, distal colon patency was confirmed by CT Loopogram study, colostomy was closed later, and the patient tolerated the procedure well.

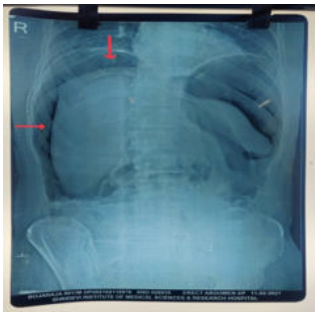
KEYWORDS : Barotrauma, colonoscopy, compressed air.

Introduction

Colon barotrauma can be mostly caused by elevated intra-luminal pressure. Air insufflation during colonoscopy procedure is the most common cause of iatrogenic colon barotrauma. Few cases of colon perforation caused by non-iatrogenic barotrauma are noted in the literature[1-5]. Colon barotrauma includes colon mucosal traumas and colon perforation with elevated intraluminal pressure, mainly caused by air[1-3]. Nowadays, compressed gases are used with increasing frequency in daily industrial work, and in gas stations, which make it handy with increasing incidence. The compressed air that are used in industry and in gas station are usually said to have a pressure of 50 to 100 lbs. or more. Compressed air enters the anus more readily and passes through clothing and enters the bowel even when not accurately inserted inside the anus. Perforation of the colon perhaps depends more upon the suddenness of the pressure than upon its amount6. In this study, we discuss a rare case of sigmoid colon perforation caused by barotrauma.

Case report

A 46-year-old man working as a labourer at rice mill factory presented to the emergency department of our institution with an alleged history of accidental injury to the anus by compressed air jet, while cleaning the dust on his clothes with air compressor. Following which he developed pain abdomen associated with abdominal distension. According to the patient's history, air nozzle was placed at a distance of approximately 20 cm from the anus for less than 1 second. On examination, pulse rate was 86 beats/min, blood pressure 136/80mmHg, and respiratory rate 24 breaths/min, abdomen was distended with tenderness in left iliac and hypogastric region, resonant note heard over all the quadrants on percussion with obliteration of liver dullness and sluggish bowel sounds, no abdominal movements were seen with respiration. His digital rectal examination was stained with blood and fecal matter.



X-ray Erect abdomen showing pneumoperitoneum

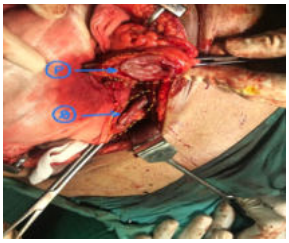
Investigations

X –ray erect abdomen showed pneumo-peritoneum [Figure 1]. CT abdomen showed gross pneumoperitoneum with possible perforation in anterior wall of sigmoid colon. Hence, emergency laparotomy was done.

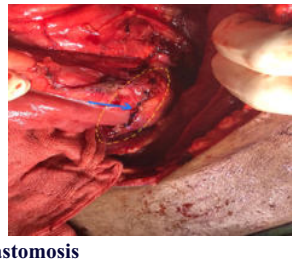
Intra operative findings

Perforation of sigmoid colon measuring 7cm's at its summit, multiple linear seromuscular tears proximal to perforation with faecal peritonitis were noted.

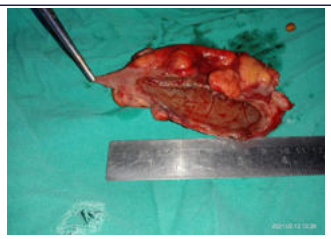
Sigmoid colon perforation with fecal peritonitis



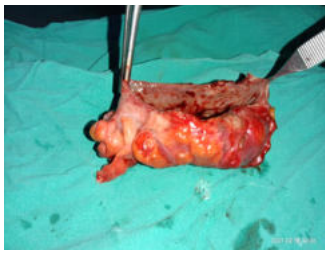
Proximal and Distal end



End to End anastomosis



Resected specimen (a)



Resected specimen (b)

Functioning stoma

Operative procedure

Resection of sigmoid colon perforation with end to end anastomosis was done. The seromuscular laceration were sutured. A descending loop colostomy was then fashioned, brought out through the abdomen wall in the left lumbar region. Post operative period was uneventful and patient was discharged after 10 days with regular follow up. After 6 weeks, distal colon patency was confirmed by CT Loopogram study, colostomy was closed later, and the patient tolerated the procedure well.

Discussion

Most cases of iatrogenic colonic barotrauma occurred during a colonoscopy procedure[5]. Their incidence is reported as 0.1 to 0.5%[6-7]. However, colonic injuries caused by high-pressure air compressor are extremely rare and reported especially among industrial workers. The cecum is the segment most prone to distention injury, which is explained by the law of Laplace. The cecum has the largest diameter and hence requires the least amount of pressure to distend[6]. The anatomical configuration of the buttocks and perineum is like a funnel; it allows easy delivery of compressed air into the anal orifice. Thus, an air jet enters the anus more readily than the examining finger or proctoscope as it passes through clothes and the anus even when not accurately directed[8]. The anatomy of the distal colon with the firm lateral support of the rectum makes the recto-sigmoid junction the first part of the colon to be struck by a column of pressure from an external source and the bending of the sigmoid contributes along with the rectosigmoid junction to perforation in pressure-related colon barotraumas[8-9]. Experimental studies have shown that the human colon bursts with only about 120–200 mmHg of pressure and that seromuscular rupture occurs at lower levels[9]. Through colonoscopic studies, it has been estimated that the intraluminal pressure required to result in colon perforation is greater than 0.109 kg/cm2 (1.547 psi/80 mmHg)[10]. However, colonic injuries following high-pressure barotrauma result in injuries elsewhere in the colon, predominantly in the rectosigmoid junction. The sudden nature of the insult does not allow air to uniformly pass through the entire colon, and the outcome is a perforation of the rectosigmoid junction. The resting pressure of the anal sphincter is 40–80 mmHg. The air flow of compressed air jet in use is estimated to be 141 L/min (5 cfm), which is 100-fold greater than the safe level airflow of 1.46 L/min (at 80mmHg intraluminal pressure) during colonoscopic examination; such an air thrust exceeds the resting anal pressure, overcomes the anal sphincter pressure, and results in sudden inflation of the colon. Thus, injury as a result of high-pressure barotrauma depends on the air pressure, air flow velocity, anal resting pressure, and the distance between the source and anus[8-10]. Small perforations can be managed by primary closure with or without a diversion colostomy or ileostomy depending on the site[10].The patient in our case had perforation of sigmoid colon with multiple linear seromuscular tears proximal to perforation and faecal peritonitis. So, we did resection of sigmoid colon perforation with end to end anastomosis and descending colon loop colostomy. Post operative period was uneventful and patient was discharged after 10 days with regular follow up. After 6 weeks, distal colon patency was confirmed by CT Loopogram study, colostomy was closed later, and the patient tolerated the procedure well. The diagnosis is not difficult if the patient has a history of abdominal pain and distension after exposure to the compressed air. However, patients with acute abdominal pain of unknown origin should be checked for trauma history and occupational history, such as construction, industrial worker and cleaners using compressed air.

Conclusion:

Colonic barotrauma due to compressed air may happen as a result of perversion or accidental injury in industrial zones. Enough safety precautions including educating the employees to be taken to prevent such injuries especially in industrial settings. The amount of injury may vary from mucosal ulceration to full-thickness blowout, depending on air pressure, air flow velocity, anal resting pressure, and the distance between the source and anus. Management ranges from repair or resection with proximal enterostomy, because multiple other injuries may perforate later and have a delayed presentation.

Learning points:

1) Intestinal perforation following insufflation of high-pressure air jet through the anus can be potentially fatal even if applied above the clothes.

2) The sigmoid and the descending colon are the most prone for injury because of its angulation and its relative fixity whereas rectum and anus are spared because of their almost vertical course.

3) The workers handling compressed air should be made aware of the hazards before allowing them to use it. The potential dangers should be prominently displayed in writing in places where it is being used to minimise such accidents in the future.

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