

Non-Iatrogenic colonic barotrauma - A case series report

Dr. Karthik C* , Dr. P. Ravisankar, Dr. J. Sridhar, Dr. Pateel Varun

Postgraduate¹, Department of General Surgery, College Vinayaka Missions Kirupananda Variyar Medical College and Hospitals, Vinayaka Missions Research Foundation (DU), Salem, Tamilnadu, India, Vinayaka Missions Research Foundation (DU), Salem, Tamilnadu, India

Professor², Department of General Surgery, College Vinayaka Missions Kirupananda Variyar Medical College and Hospitals, Vinayaka Missions Research Foundation (DU), Salem, Tamilnadu, India, Vinayaka Missions Research Foundation (DU), Salem, Tamilnadu, India

Professor³, Department of General Surgery, College Vinayaka Missions Kirupananda Variyar Medical College and Hospitals, Vinayaka Missions Research Foundation (DU), Salem, Tamilnadu, India, Vinayaka Missions Research Foundation (DU), Salem, Tamilnadu, India

Associate Professor⁴, Department of General Surgery, College Vinayaka Missions Kirupananda Variyar Medical College and Hospitals, Vinayaka Missions Research Foundation (DU), Salem, Tamilnadu, India, Vinayaka Missions Research Foundation (DU), Salem, Tamilnadu, India

Corresponding Author: Dr. Karthik C*

Email ID: karthikchandra1998@gmail.com

Abstract:

Background:

Occurrence of colonic barotrauma during colonoscopy procedure is not uncommon, whereas colonic injury due to high pressure compressed air are very rarely reported. It is now a days becoming common among industrial workers who have access to machinery like high grade air compressors and the mechanisms of such injuries are not well understood. In this case series report we present three cases of non-iatrogenic induced colonic barotrauma, their clinical presentation and management.

Case presentation:

The mode of injury in all the three patients were playful act of inserting high air pressure in anus. The common presentation was severe abdominal pain with distended abdomen. The imaging picture was suggestive of pneumoperitoneum. All three cases were managed by undergoing emergency laprotomy followed by resection of the affected part and colostomy was performed.

Conclusion:

The amount colonic injury may vary from ulcers in the mucosal region to multiple perforations, which depends on air pressure, velocity of air flow velocity, resting anal sphincter pressure, and the distance between the anus and source of air. Pre-employment education to industrial workers on safety measures of air pressure machineries would prevent such occurrences in future.

Keywords:

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Introduction :

The current industrial era has given easy access and availability of heavy machineries, which when used without proper knowledge or using it playfully would result in major disaster. One such example is the incidence of colonic barotrauma.¹ Colonic barotrauma refers to injuries in the colon, including mucosal trauma or perforation in the colon which is due to elevated intraluminal pressure, caused because of passing a sudden high pressure in the anal region. Iatrogenic colonic barotrauma due to colonoscopy procedure was once considered to be the most common cause but recent years had shown that non-iatrogenic causes of colonic barotrauma are also increasing like placing tyre inflator pressure pipes in the anus or self induced barotrauma as a result of sexual pleasure.² The commonest site of injury in the colonic barotrauma is the rectosigmoid junction, as it is more prone to rupture because of its relative fixity of the rectum and the bends of the sigmoid.³ The colonic injuries

may vary from small mucosal tears (cat scratch colon) to full length perforation of the colon.

According to the literature the first case of colonic barotrauma was reported in 1904 by Stone et al, now it is a more than a century of years but still only a handful of cases have been reported.⁴ Colonic barotrauma is an acute emergency which needs to be addressed at the earliest to avoid any sort of fatality among the patients. Identifying and managing these patients is a real challenge for the surgeons because of lack of treatment protocol being mentioned in the literature.⁵ Generally the management for colonic barotrauma ranges between conservative treatment and exploratory laprotomy depending on the severity of the colonic injury. In this case series report we will describe three cases of non-iatrogenic colonic barotrauma that was reported in our hospital, its clinical presentation and management.

Case presentation:

Institutional ethical committee clearance was obtained from our institution and informed consent

was taken from all the three patients involved in our study for publishing their disease scenario and the surgical intervention in a journal.

Case report 1 :

An 18- year old boy, who is working in a cement factory presented to our emergency OPD with complaints of severe abdominal pain with distended abdomen for past 4 hours. The patient attender gave a history that the patients friend had kept the air compressor tube in his anus playfully for 2 - 3 secs, following which he developed abdominal discomfort and distension. His vitals at the time of admission were Bp - 110/60 mm Hg, PR - 110/min and SPO2 - 88%. Physical examination showed that the abdomen was grossly distended, diffuse tenderness was present and resonant note was present on percussion, bowel sounds were absent. With the above clinical findings and the history we suspected it could be a case of barotrauma. Blood investigations found to be insignificant. CT abdomen was performed and the picture showed a gross pneumoperitoneum with gross pockets of air in the retro-peritoneal region. Abdomen was decompressed immediately to avoid abdominal compartment syndrome and the diaphragm was compressed, in such a way the SPO2 was improved. Patient was then shifted to operation theater for emergency laparotomy, which showed a perforation of 3*3 cms in the sigmoid colon involving anterior mesentric border leading onto faecal peritonitis. Being an early perforation with minimal fecal contamination we decided to go for a perforation closure after giving a peritoneal lavage. A flatus tube was inserted for diversion colostomy. The immediate postoperative period was uneventful. Patient had passed flatus and stools on postoperative day 3 through the flatus tube, and it was removed on the 5th POD. The patient was discharged on the 7th POD and he returned to his normal routine with ease. CT picture and perforation closure was shown in fig 1.

Case report 2:

A man aged 35years presented to the casualty with complaints of acute abdominal pain with distension since yesterday. Patient was found to be mentally challenged and the attender who had accompanied the patient gave a history that the patient had accidentally placed a compressed air tube into his anus. His vitals recorded were PR - 90/min, BP - 100/70 mm Hg and SPO2 - 88%. Physical examination showed that the abdomen was grossly distended, tender and resonant on percussion. Bowel sounds were not heard. Blood parameters were found to be within normal limits. CT imaging showed signs of pneumoperitoneum, with the above findings we confirmed the diagnosis as abdominal barotrauma. Patient was taken up for emergency laprotomy and it revealed a perforation in transverse colon. Resection anastomosis with loop colostomy was performed and the patient

was hemodynamically stable after the surgery. The patient was given proper post operative care and the post-operative period was normal without complications. Patients attender was counseled and taught about the care to be given to the patient after loop colostomy. Patient was discharged on 8th POD and he is currently on regular follow up. Reversal surgery for loop colostomy is yet to be planned. CT picture, operating procedure and final wound closure was shown in fig 2.

Case report 3:

A male patient aged 20 years reported to our casualty with complaints of acute pain abdomen with distension that was lasting for the past 5 hours. Patient admitted that he had inserted compressed air into his anus, as means to sexually gratify himself. After which he developed severe, generalized pain over the abdomen without relieving or aggravating factors. On examination, his BP was 90/60 mm Hg; Spo2 was 86% and PR was 90/ min. Abdomen was grossly distended with resonant note on percussion and bowel sounds were not heard. Patient was stabilized hemodynamically by administering IV fluids and then he was shifted for imaging. CT image showed picture of pneumoperitoneum and with above clinical picture and history we confirmed it is a case of abdominal barotrauma. Abdomen was decompressed immediately to prevent the abdominal compartment syndrome and the patient was immediately shifted to operation theater for emergency laprotomy. It revealed a perforation in sigmoid colon for which resection anastomosis with loop colostomy along with closure of rectal stump was performed. Post-operative period was uneventful and the patient was discharged on 7th POD with a functioning stoma and he was properly counselled and advised about the care to be given for the functional stoma. Patient is currently under regular follow-up, reversal surgery is yet to be planned. X-ray picture and colonic perforation of the case is shown in fig 3.

Fig 1: CT image and perforation closure of case report no. 1

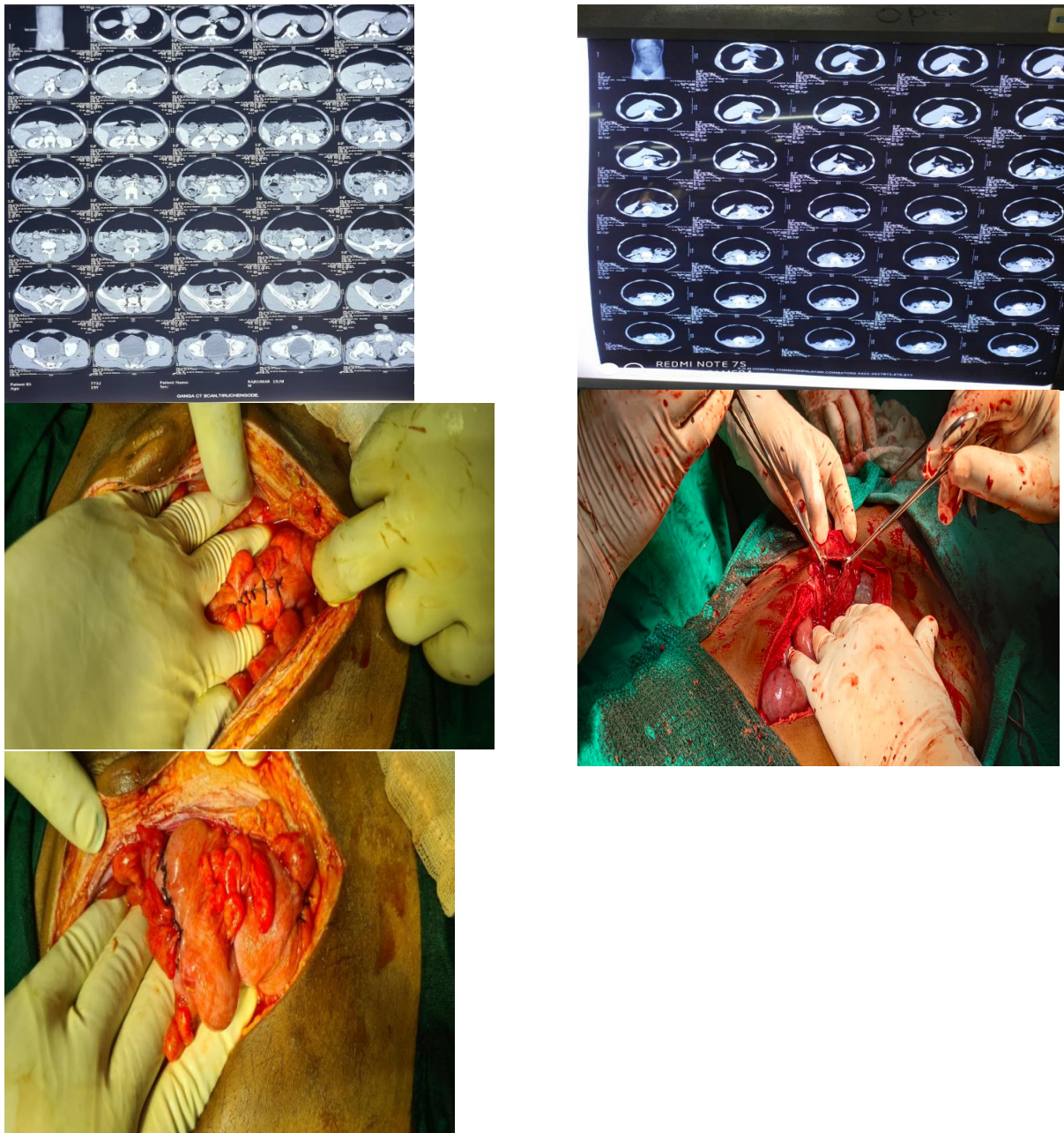


Fig 2: CT image, operating procedure and final wound closure of case report 2

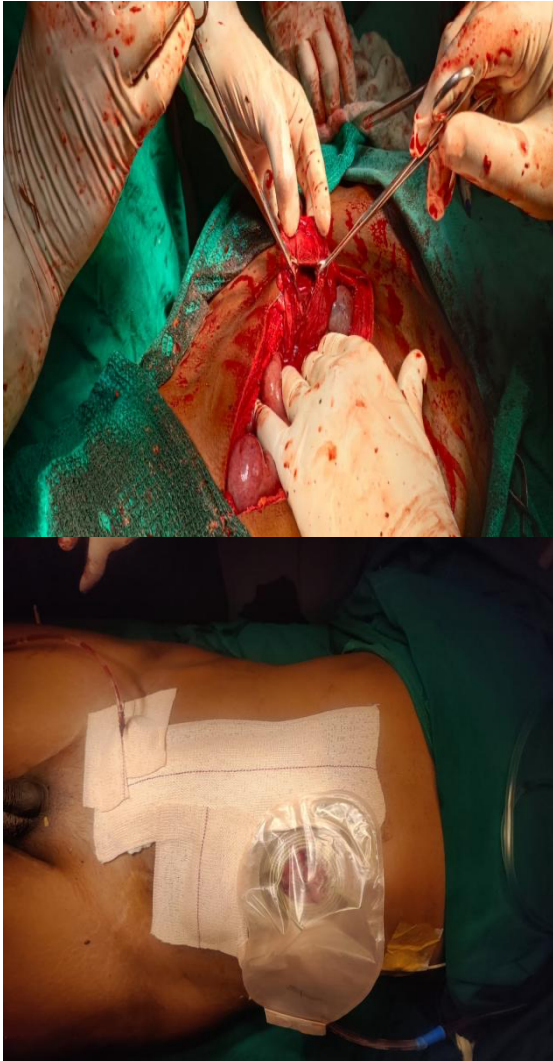
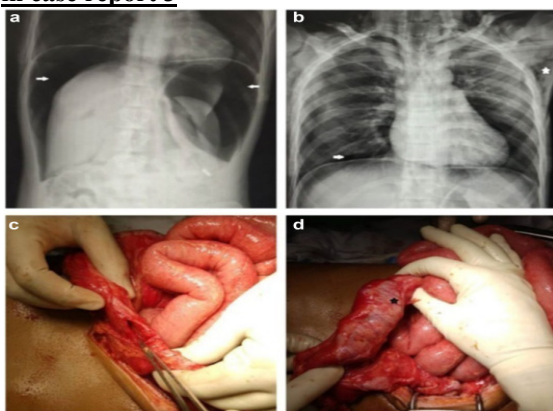


Fig 3a, 3b.: X-ray picture showing pneumoperitoneum 3c, 3d.: colonic perforation of 3 cms size seen during emergency laprotomy in case report 3



Discussion:

Incidence of iatrogenic colonic barotrauma is not uncommon, as reports have shown the incidence ranges between 0.3 and 0.5%. Colonoscopy procedure is the most common cause for iatrogenic barotrauma, it is usually a mild variant which is termed as cat-scratch colon. Whereas colonic injury resulting due to high pressure compressed air, is a

rare entity where very few case report have been reported in literature and it is usually common among males working in industries that are dealing with compressed air equipment and the injury occurs as a result of prank of playful event among the workers. Lack of awareness about the machinery and certain personality disorders are some of the factors responsible for such incidence.⁶ Anal sphincter's resting pressure is generally around 40–80 mmHg. During colonoscopic procedure the air flow used in the compressed air jet is estimated to be 140 L/min which is hundred times greater than the normal level airflow, this would lead to sudden inflation of the colon and thereby leading onto colon injury.^{7,8} A postulate made by Andrew quoted that air at a pressure of 3.5–8.5 kg/cm² (2585–6464 mmHg) when passed into anus for a period of 1 - 2 seconds can cause a major damage to colon which ranges between colonic injury and colonic perforation. In his postulates he further estimated that a pressure of 0.27 kg/cm² (201.69 mmHg) is sufficient to rupture the serosa and the muscles of the colonic wall, and a pressure of 0.29 kg/cm² (210.48 mmHg) could cause a through-and-through rupture of the intestinal wall.⁹

For treating surgeons, managing colonic injuries that had occurred due to barotrauma is a real challenge. The most common presentation in colonic barotrauma is the patient gives a history of playful act that involves insertion of air compressor into anus following which the patient experiences severe abdominal pain accompanied with or without vomiting and shock.¹⁰ Detailed history, clinical presentation along with radiological evaluation will guide us in arriving a diagnosis. Three cases reported in our study also had a similar type of history and clinical manifestations and with radiological imaging we confirmed the diagnosis. Few case reports have reported occurrence of tension pneumoperitoneum with hemodynamic and respiratory compromise.¹¹ In our case series all cases had the picture of pneumoperitoneum and abdominal decompression was performed in all the cases to avoid abdominal compartment syndrome. No tension pneumoperitoneum was found in our case series.

The mechanism of developing hypotension in colonic barotrauma is due to decreased venous return to the heart because of inferior vena cava and splanchnic circulation compression, thereby leading to shock. Respiratory depression occurs because of elevation of the diaphragm due to pressure that is occurring from below reduces the lung volume and affects the ventilation¹². Death becomes inevitable if not treated immediately. The most common causes for death are air or fat embolism, respiratory insufficiency and acute heart failure due to deficient preload. Compression of aorta would lead to bowel ischemia and rarely

ischemia of lower extremities.¹³ So timely intervention is a mandate in colonic barotrauma. In all our cases the time interval between the patient arrival at emergency room and emergency laprotomy was less than 1 hour.

Literature showed that majority of the perforations that had occurred during colonoscopy procedure are mostly single, whereas perforation that had occurred due to sudden rapid flow of air pressure air results in multiple site perforations.¹⁴ In a study by Brown and Dwindle who had reviewed 32 cases of pneumatic colon perforation; 91% (29/32) had single perforations, 6 (2/32) had three perforations, and 3% (1/32) had two perforations.¹⁵ A case series report done by Nandkishor Sopanrao Sude et al, reported that out of three cases two had multiple site perforations and one among the multiple site perforation had a multiple caecal perforations, which was found to be a rare finding and that patient found to have a longer air pressure insufflation time compared to others. Retroperitoneal sepsis had occurred in that patient and finally succumbed to death.¹⁶ This shows that longer the time of insufflation more severe the complications. In our case series, two patients had single perforation and one patient had two perforations and all were timely managed without any undue complications. As quoted by previous case reports treatment usually depends on the degree of injury noted intra-operatively and for most of the cases the management would be resection with proximal enterostomy,¹⁴⁻¹⁶ in our case also for all the three patients resection was done along with loop colostomy. Post-op period was uneventful and all patients were counseled and advised about the care to be given for the functional stoma.

Conclusion:

Occurrence of colonic barotrauma due to sudden insufflation of air is commonly seen among young males working in industries or factories. Lack of awareness about the hazards of air compressors and playful acts are the common factors leading onto such incidents. The amount colonic injury may vary from ulcers in the mucosal region to multiple perforations, which depends on air pressure, velocity of air flow velocity, resting anal sphincter pressure, and the distance between the anus and source of air. Emergency laprotomy followed by resection of the affected part along with colostomy is mandated in most of the cases based on the severity of barotrauma. Along with it pre-employment education to industrial workers on safety measures of air pressure machineries would prevent such occurrences in future.

DECLARATIONS

Conflicts of interest: There is no any conflict of interest associated with this study

Consent to participate: There is consent to participate.

Consent for publication: There is consent for the publication of this paper.

Authors' contributions: Author equally contributed the work.

References:

1. Jentschura D, Raute M, Winter J, Henkel T, Kraus M, Mane gold BC. Complications in endoscopy of the lower gastrointestinal tract: therapy and prognosis. Surg Endosc.1994;8(6):672-6.
2. Tulchinsky H, Madhala-Givon O, Wasserberg N, Lelcuk S, Niv Y. Incidence and management of colonoscopic perforations: 8 years' experience. World J Gastroenterol. 2006;12(26):4211-3.
3. Lüning TH, Keemers-Gels ME, Barendregt WB, Tan AC, Rosman C. Colonoscopic perforations: a review of 30,366 patients. Surg Endosc. 2007;21(6):994-7.
4. Stone GW. Rupture of the Bowel Caused by Compressed Air. Lancet. 1904;164(4221):216-7
5. Brayko CM, Kozarek RA, Sanowski RA, Howells T. Diverticular rupture during colonoscopy: fact or fancy? Dig Dis Sci. 1984;29(5):427-31.
6. Lovenish Bains, Amit Gupta, Ronal Kori , Vignesh Kumar and Daljit Kaur. Transanal high pressure barotrauma causing colorectal injuries: a case series. Journal of Medical Case Reports. (2019) 13:133.
7. Woltjen JA. A retrospective analysis of cecal barotrauma caused by colonoscope air flow and pressure. Gastrointest Endosc. 2005;61:37-45.
8. Andrews EW. Pneumatic rupture of the intestine, a new type of industrial accident. Surg Gynecol Obstet. 1911;12:6372.
9. Burt CAV. Pneumatic rupture of the intestinal canal. Arch Surg. 1931;22:875- 902.
10. Sy ED, Chiu YI, Shan YS, Ong RL. Pneumatic colon injury following high pressure blow gun dust cleaner spray to the perineum. Int J Surg Case Rep. 2015;6C:218-21.
11. Choi JY, Park KS, Park TW, Koh WJ, Kim HM. Colon barotrauma caused by compressed air. Intest Res.2013;11(3):213-6.
12. Zunzunegui RG, Werner AM, Gamblin TC, Stephens JL, Ashley DW. Colorectal blowout from compressed air: case report. J Trauma. 2002;52(4):793-5.
13. Avallone S, La Torre M, Meurette G. Rectal injury by compressed air. J Trauma. 2010;68(1):248.
14. Bains, L., Gupta, A., Kori, R. et al. Transanal high pressure barotrauma causing colorectal injuries: a case series. J Med Case Reports.2019. 13:133..
15. R.K. Brown, J.H. Dwinelle, Rupture of the colon by compressed air: report of three cases, Ann. Surg. 1942.115; 13-20.

16. Ravi Kumar Teppa, Nandkishor Sopanrao Sude, Venkata Pavan Kumar Karanam, Prasanth Gurijala et al. *International Journal of Surgery and Medicine*. 2023. 9(2): 40-43.