

CASE REPORT

Fatal recto-sigmoid rupture by compressed air

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Abstract Compressed air is a concentrated stream of air at high pressure and high speed that can cause fatal injury to the operator and the people around him when handled inappropriately. The case herein reported is that of a victim of a practical joke, who suffered a fatal recto – sigmoid rupture due to transanal insufflation of compressed air at his workplace. The case highlights the need for implementation of guidelines for safe handling of compressed gases and it also calls for appropriate work place etiquette to avoid such fatal practical jokes at work.

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1. Introduction

Compressed air is air kept under a pressure that is greater than atmospheric pressure. Compressed air is widely used for both industrial and domestic purposes. Since it stores large amounts of energy at high pressure, injudicious use may lead to grave incidents at the workplace. A misdirected jet of compressed air to the head can cause serious eye injuries or rupture of the eardrum. Aiming the compressed air into the mouth can damage the lungs and esophagus. Careless use of compressed air to blow away dirt or dust from the body, even with a protective layer of clothes, could allow the air to enter the body, which can damage the internal organs.

Among the injuries caused due to compressed air, colon injury caused by its trans-anal insufflations are dangerous. Compressed air injuries should be taken seriously because the high pressure of compressed air into the rectum in a very

short time can overcome barriers as clothes and anal sphincter delivering an enormous amount of pressurized air into the rectum, resulting in rectal and colonic perforation and development of tension pneumoperitoneum. It was suggested that it takes only 1 or 2 s to deliver enough compressed air to cause major damage.¹

Herein we report one such case of trans-anal barotrauma caused due to compressed air which was used playfully over the co-worker.

2. Case report

An adult male aged 42 years was a worker in the car service center. He was made the victim of a practical joke by his colleagues who approached him from behind, insufflated the compressed air through anal route using the compressed air cleaner. The said air cleaner was being used to clean off the dirt from the cars at the service center. Following which, the victim complained of severe abdominal pain and hence was taken to a hospital where emergency exploratory laparotomy was performed, which revealed recto sigmoid perforation. Closure of the perforation was done with proximal diversion colostomy.

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Post-operatively the patient developed secondary peritonitis and sepsis. Hence the patient was referred to our hospital for further evaluation. His condition worsened and he succumbed to the injuries 5 days later. The accused persons were charged under the offence of murder and the judgment is awaited in the court.

2.1. Autopsy findings

On external examination of the deceased, an abraded wound was present at the anal margin (Fig. 1). Laparotomy suture wound was present along the midline of the abdomen and colostomy wound with drainage tube in situ, was present in the left iliac region (Fig. 2). On internal examination, peritoneum showed features of peritonitis and ulceration (Fig. 3). Multiple surgical sutures were found along the recto sigmoid junction (Fig. 4). On perusal of hospital findings, revealed that chest radiograph showed features of acute respiratory distress syndrome, Arterial Blood Gas analysis was suggestive of metabolic acidosis, total leukocyte count was elevated to 22,500/cmm, platelet count was 94,000/cmm and both renal and liver function tests were altered.

The cause of death was hence opined as multi-organ failure due to septicemia following peritonitis consequent upon the rupture of the recto sigmoid junction of the intestine.

3. Discussion

Transanal barotrauma due to compressed air leading to colonic injury has been reported from time to time. It was first reported in the literature in 1904.² Air insufflation during colonoscopy procedure was found to be the most common cause of colon barotraumas. The trauma to the colon may range from a mild “cat scratch” colon to complete perforation.³ Case analysis of pressurized air injuries often reveals an erroneous behavior of the workplace colleague, which has been the

scenario in the present case. Similar case has been reported by a group of Indian authors, wherein high-pressure compressed air jet was playfully insufflated through the anal orifice of the victim resulting in sigmoid perforation.⁴ Incidence of accidental injury has been reported while the person tries to hose off the dust from the clothing. It has been noticed that even when the air hose was distant from the body, it had resulted in fatal colonic injuries penetrating through the clothes. Although the air pressure varied in different situations; it took only 1 or 2 s to deliver enough pressurized air to cause major damage. The rupture usually occurs in a longitudinal direction along the muscle fibers with full thickness perforation or with stripping of the serosa and muscularis.⁵ The most common location of injury was the anti-mesenteric surface of the sigmoid colon.⁶ The sudden high velocity insufflation of air induces extreme shear force at the point of maximal fixation. The recto-sigmoid junction has bilateral fixation, which limits its mobility; thus, compressed air insufflation with high velocity can cause recto-sigmoid colon barotrauma.⁷ The above mentioned finding was consistent in our case.

A study done by Andrews, using compressed air to distend the intestine of oxen and dogs has shown that the normal intestine will be ruptured by a pressure of 0.49–0.88 kg/cm². He opined that air at 3.5–8.8 kg/cm² forms a column which acts as a solid body forcing open the anal sphincter. On the other hand, Burt demonstrated that average pressure of 0.29 kg/cm² was sufficient to rupture the full thickness of bowel of human gastrointestinal tract.⁸

The overall mortality of pneumatic rupture of the bowel was assessed to be at 65%. If the acute shock was not immediately fatal, the survival was depending on further treatment. Surgery reduced mortality to 42%. The pathophysiology of death can be (a) acute air embolism, (b) acute fat embolism, (c) acute respiratory insufficiency due to enhanced intra-abdominal pressure and chest compression, (d) acute heart failure due to insufficient preload and (e) peritoneal shock. Recovery is usual if only the serous and muscular coats are



Figure 1 Abraded wound at the anal margin.



Figure 2 Laparotomy suture wound with drainage tube.



Figure 3 Features of peritonitis and ulceration.

torn.⁹ In our case, as there was a complete rupture of the recto-sigmoid junction, fecal contamination and delay in medical aid predisposed the victim to peritonitis resulting in septicemia and death.

All compressed gas containers are so constructed that they are safe for the purpose for which they are intended when first put into service. However, serious accidents may result from their misuse, abuse or mishandling, and therefore greatest care should be exercised in the handling of such cylinders or

containers. The handling of compressed gases in India is governed by, The Gas Cylinders Rules 2004 – which deals with license related issues for filling or possessing the cylinder with compressed air. It also lists the safety features to be installed in the cylinder to be used, the safe practices to be adopted during filling, transportation and usage. Other statutes in India which regulate the usage of compressed air are, The Static and Mobile Pressure Vessels (unfired) Rules which prescribe separate licenses for storage and transportation of compressed

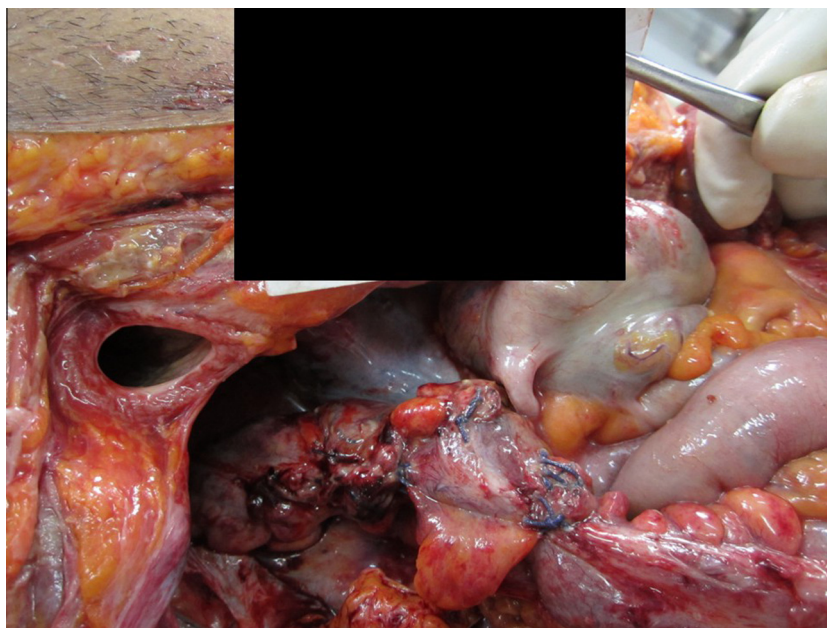


Figure 4 Sutures at the recto-sigmoid junction.

gases and Bureau of Indian Standards which has issued a number of standards pertaining to the design, transportation and handling of compressed gases.¹⁰ The present case appears to be of culpable homicide not amounting to murder, as there was no *Mens Rea* on part of the accused persons. Though the initial charges are that of murder, the culpability of the offence will be decided in the court of law after a complete trial.

4. Conclusion

The presence of sporadic reports of such colonic injuries due to misuse of compressed air, calls for urgent policy reforms with respect to handling and usage of compressed air in the industrial as well as domestic set up. Strict workplace safety guidelines need to be implemented, to discourage the workers indulging in so called “practical joke” with compressed air. Mishaps due to inappropriate usage of compressed air could be prevented only when compressed air and related components are treated as professional tools – something that facilitates the work, but only if handled properly and safely.

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Conflict of interest

The authors like to report no conflict of interest in this case report.

Ethical approval

Necessary ethical approval was obtained from the institute ethics committee.

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