

Case Report

A rare case of simultaneous pneumoperitoneum and pneumomediastinum without hollow viscus perforation

Milan Agrawal*, Iliyas A. Juneja

Department of General Surgery, Pandit Deendayal Upadhyaya Medical College and Hospital, Rajkot, Gujarat, India

Received: 03 April 2024

Revised: 06 May 2024

Accepted: 13 May 2024

*Correspondence:

Dr. Milan Agrawal,

E-mail: insanmilan001@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Traumatic pneumoperitoneum and pneumomediastinum managed conservatively are rare in surgical practice. This report describes an atypical case of 10-year-old male child with pneumoperitoneum, pneumomediastinum, extensive subcutaneous emphysema and an exceptionally rare finding of air in spinal canal, all managed conservatively. We report a case of 10 years old male child who presented with a compressed air injury to the perianal region. On further investigation, a diagnosis of traumatic pneumoperitoneum, pneumomediastinum and subcutaneous emphysema without hollow viscus perforation was established. He was managed conservatively. This case highlights the successful conservative management of child with traumatic pneumoperitoneum and pneumomediastinum. Many times explorative laparotomy is performed based on findings of pneumoperitoneum on abdominal radiograph and computed tomography (CT), which later turns out to be negative. Hence, clinical judgements may override trauma protocols in selected cases. Pneumoperitoneum preceded by a reasonable clinical history in patient with adequate abdominal examination may warrant continued observation, thus avoiding an unnecessary laparotomy.

Keywords: Pneumoperitoneum, Pneumomediastinum, Hollow viscus perforation, Conservative management

INTRODUCTION

Pneumoperitoneum typically results from intraabdominal gas due to gastrointestinal perforation and emergency exploratory laparotomy serving as the standard management. Pneumoperitoneum requires emergency laparotomy in 90% of cases.¹ However, simultaneous occurrence of pneumoperitoneum and pneumomediastinum without evidence of hollow viscus perforation are exceedingly rare. We present a unique case of a 10 year old child who had compressed air injury to the perianal region, resulting in simultaneous pneumoperitoneum, pneumomediastinum, extensive subcutaneous emphysema, and an exceptionally rare finding of air in the spinal canal.

This is a rare case due to the unconventional mechanism of injury and the atypical extension of air into the spinal canal. In this report, we explain the clinical presentation,

diagnostic approach, and conservative management strategy. We aim to highlight the importance of thorough clinical examination and judicious utilization of diagnostic modalities to prevent unnecessary laparotomy and guide appropriate management decisions in similar cases. This manuscript was prepared in accordance with the SCARE 2023 guidelines.²

CASE REPORT

A 10-year-old male child presented to the emergency department with accidental trauma over the perianal region by compressed air when the child was playing with his friends. His presenting complaints included abdominal pain, distension, 3 episodes of vomiting and perineal pain. There were no complaints of bleeding per rectum.

On admission, respiratory rate was 28/min, with oxygen saturation of 97% on room air and a pulse rate of 96/min.

The Glasgow coma scale score was 15. Examination revealed extensive subcutaneous crepitation all over the body. Abdomen was grossly dilated, with tenderness on deep palpation over abdomen, there were no signs of peritonitis. Respiratory examination revealed equal bilateral air entry. Heart sounds were normal on auscultation.

Whole blood count revealed an elevated white blood cells count 23,200/cubic millimeter. Hemoglobin was 10.5 gm/dl. Creatinine and electrolytes were within normal limits.



Figure 1: Injury at 2'oclock region of anus (white arrow).

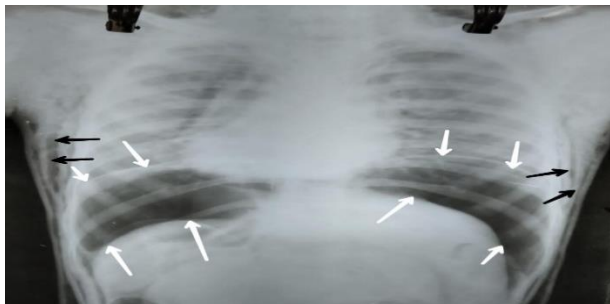


Figure 2: An erect chest and abdominal radiograph showed extensive free gas under the diaphragm (white arrow) and extensive subcutaneous emphysema (black arrow). These findings were suggestive of pneumoperitoneum.

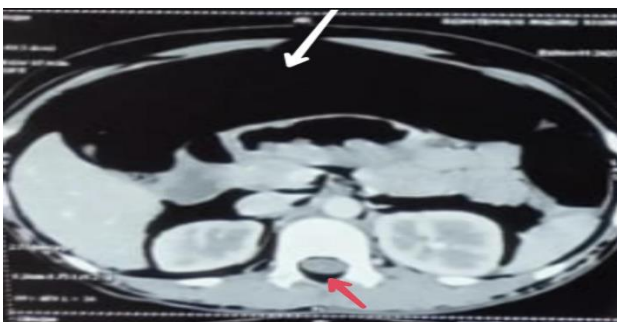


Figure 3: CECT abdomen showing the presence of pneumoperitoneum (white arrow), pneumomediastinum and air in the spinal canal (red arrow).

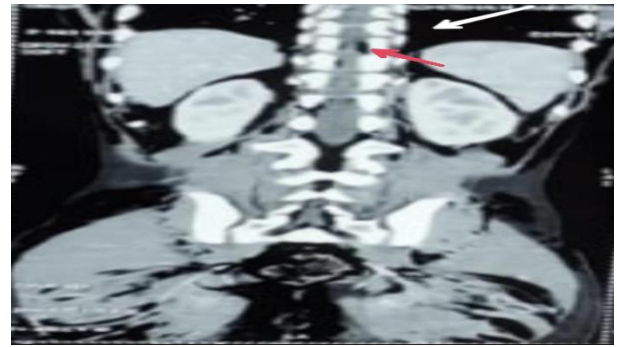


Figure 4: CECT abdomen showing the presence of pneumoperitoneum (white arrow) and air in the spinal canal (red arrow).

Delayed scan with positive oral and rectal contrast showed no evidence of extravasation of contrast from opacified bowel loops.

The patient was diagnosed with traumatic pneumoperitoneum, pneumomediastinum and subcutaneous emphysema without hollow viscus perforation. Empirical antibiotics, supportive oxygen and analgesia were provided.

The patient remained hemodynamically stable and afebrile throughout the admission. The subcutaneous emphysema and abdominal distension started to decrease from the 5th day of admission. The patient was started on normal diet from 6th day of admission. On the 14th day, subcutaneous emphysema and abdominal distension were minimal. The patient was discharged on the 18th day of admission.

During the follow-up visit that occurred one month after discharge, the child has been found to be playful and doing well.

DISCUSSION

We present a case of traumatic extensive subcutaneous emphysema with simultaneous pneumoperitoneum and pneumomediastinum which was managed conservatively. Clinical practice guidelines for blunt abdominal trauma suggest exploratory laparotomy when free air is present on imaging. This conventional algorithmic approach of taking up for surgery when pneumoperitoneum is present, has its demerits as is illustrated in the case study where a child with polytrauma was managed conservatively despite free air on computed tomography (CT).

Surgical cases of pneumoperitoneum constitute the majority, accounting for 85-90% of occurrences, while non-surgical cases make up 5-15%.³ Perforated viscus is the most common etiology (85-95%), typically necessitating surgical exploration as the primary treatment. However, non-surgical management has been documented in cases related to mechanical ventilation,

amyloidosis, pneumatosis intestinalis, and spontaneous bacterial peritonitis.^{4,5}

Traumatic pneumoperitoneum cases usually warrant surgical exploration, but studies, such as the one by Currin et al involving 492 trauma patients, have reported successful non-operative management in two cases using follow-up ultrasound scans. Traumatic perforation commonly involves hollow viscus and diaphragm injuries, with rare instances of intraperitoneal bladder perforation.^{6,7} A case report by Ubukata et al described idiopathic pneumoperitoneum following high-energy vehicular trauma, emphasizing the absence of obvious gastrointestinal perforation after exploratory laparotomy.⁸ Management considerations, as suggested by Ramponi et al emphasize that clinical evaluation and diagnostic findings determine whether surgical intervention or conservative treatment is appropriate. Monitoring vital signs, leucocytosis, recovery of bowel function, and resolution of discomfort are key factors in assessing patients for conservative therapy.⁹

The simultaneous occurrence of pneumoperitoneum, pneumomediastinum and subcutaneous emphysema is rare. The most commonly reported mechanisms are barotrauma, and instrument puncture caused by colonoscopy.¹⁰⁻¹² Depending on the site of perforation, intraluminal air may escape into the peritoneal or retroperitoneal space.^{10,11} The ectopic air may travel into different body compartments through distinct anatomical fascial planes.¹⁰ It is conceivable that the force generated by the compressed air led to the disruption of tissue planes, allowing air to track along fascial planes and penetrate into anatomical compartments. However, the exact pathway and factors contributing to the dissemination of air require further exploration.¹³

Retroperitoneal air may pass into the mediastinum through esophageal or aortic hiatus of the diaphragm.^{10,11,12,14} Subcutaneous emphysema may occur when air travels along the mesentery to the abdominal wall and then spreads to the chest wall.¹⁰ In rare cases, pneumothorax can occur if the mediastinal parietal pleural ruptures.¹¹

There is no strong suggestion of particular treatment and the choice is based on a case-by-case basis.^{15,16} Conservative treatments is acceptable in patients in good condition, with stable hemodynamics and no signs of peritonitis.^{15,16} A literature review including 32 cases of extra peritoneal colonic perforation following colonoscopy reported that the most common site of perforation was the recto sigmoid colon and pneumomediastinum was the most common imaging finding.¹⁶ Conservative treatment was successful in most patients (53%) in this review.¹⁶ However, surgical intervention is indicated if there is evidence of peritonitis, fecal content leakage, and no improvement or worsening after conservative treatment.^{15,16}

A review of existing literature reveals limited similar case reports, with most focusing on pneumoperitoneum and pneumomediastinum separately. This case adds to the sparse body of literature on this topic and highlights the need for further exploration to understand the underlying mechanism and management strategies for such a compound presentation.

The decision to continue conservative management was made cautiously, considering the potential risks and benefits of surgical intervention versus non-surgical management. Conservative management was continued as the child remained vitally stable with absence peritonitis and worsening clinical symptoms during the hospital stay. The child showed gradual improvement with conservative management over the course of hospitalization.

CONCLUSION

The findings of pneumoperitoneum and pneumomediastinum on CT should be clinically correlated before planning for laparotomy. Though numerous protocols exist for trauma a decision made on clinical findings is vital.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

REFERENCES

1. Hoover EL, Cole GD, Mitchell LS, Adams CZ, Hassett J. Avoiding laparotomy in nonsurgical pneumoperitoneum. *Am J Surg*. 1992;164:99-103.
2. Sohrabi C, Mathew G, Maria N, Kerwan A, Franchi T, Agha RA. The SCARE 2023 guideline: updating consensus Surgical CASE Report (SCARE) guidelines. *Int J Surg*. 2023;109(5):1136-40.
3. Kdkhodaie HR, Vaziri M. Asymptomatic spontaneous pneumoperitoneum. *Shiraz E-Med J*. 2008;9(4):e93750.
4. Tanner TN, Hall BR, Oran J. Pneumoperitoneum. *Surg Clin North Am*. 2018;98:915-32.
5. Mularski RA, Sippel JM, Osborne ML. Pneumoperitoneum: a review of nonsurgical causes. *Crit Care Med*. 2000;28:2638-44.
6. Currin SS, Simmers CD, Tarr GP, Harkness GJ, Mirjalili SA. Benign posttraumatic pseudopneumoperitoneum. *AJR Am J Roentgenol*. 2017;209:1256-62.
7. Parvez M D, Supreet K, Ajay S, Subodh K. Intraperitoneal urinary bladder rupture as a cause of pneumoperitoneum. *Am Surg*. 2023;89:2079-81.
8. Ubukata Y, Sohda M, Sakai M, Nakazawa N, Hara K, Sano A, et al. Idiopathic pneumoperitoneum diagnosed following high-energy motor vehicular trauma:a case report. *J Med Invest*. 2022;69(1.2):155-7.
9. Ramponi DR. Pneumoperitoneum. *Adv Emerg Nurs J*. 2018;40:87-93.

10. Abdalla S, Gill R, Yusuf GT, Scarpinata R. Anatomical and Radiological Considerations When Colonic Perforation Leads to Subcutaneous Emphysema, Pneumothoraces, Pneumomediastinum, and Mediastinal Shift. *Surg J.* 2018;4:e7-13.
11. Hekimoğlu E, Turna A, Kara V, Demirkaya A, Kaynak K. Rectosigmoidoscopy complicated by bilateral pneumothoraces, pneumomediastinum, pneumoperitoneum, pneumoretroperitoneum, and pneumoderma. *Ulus Travma Acil Cerrahi Derg.* 2017;23:269-71.
12. Kim BH, Yoon SJ, Lee JY, Moon JE, Chung IS. Subcutaneous emphysema, pneumomediastinum, pneumoretroperitoneum, and pneumoperitoneum secondary to colonic perforation during colonoscopy. *Korean J Anesthesiol.* 2013;65:S103-4.
13. Johnson CD, Ellis H. Acute pneumoperitoneum secondary to gastrointestinal perforation. *Br J Surg.* 2021;108(4):345-56.
14. Kourounis G, Lim QX, Rashid T, Gurunathan S. A rare case of simultaneous pneumoperitoneum and pneumomediastinum with a review of the literature. *Ann R Coll Surg Engl.* 2017;99:e241-3.
15. Falidas E, Anyfantakis G, Vlachos K, Goudeli C, Stavros B, Villias C. Pneumoperitoneum, Retroperitoneum, Pneumomediastinum, and Diffuse Subcutaneous Emphysema following Diagnostic Colonoscopy. *Case Rep Surg.* 2012;2012:1-4.
16. Tiwari A, Sharma H, Qamar K, Sodeman T, Nawras A. Recognition of Extraperitoneal Colonic Perforation following Colonoscopy: A Review of the Literature. *Case Rep. Gastroenterol.* 2017;11:256-64.

Cite this article as: Agrawal M, Juneja IA. A rare case of simultaneous pneumoperitoneum and pneumomediastinum without hollow viscus perforation. *Int Surg J* 2024;11:993-6.