


CASE REPORT



## A case report of gastric emphysema induced by noninvasive positive airway pressure

Fahad Malik <sup>a</sup>, Natalia Lattanzio<sup>b</sup>, Karen Veloso<sup>a</sup> and Jay Nfonoyim<sup>a</sup>

<sup>a</sup>Internal Medicine, Richmond University Medical Center, Staten Island, NY, USA; <sup>b</sup>Saint George University School of Medicine, True Blue, Grenada, West Indies

### ABSTRACT

Gastric emphysema is a rare medical condition in which air penetrates any layer of the gastric wall (mucosa, submucosa, muscle layer, or serosa) due to a noninfectious source. It is essential to differentiate this from a life-threatening condition known as emphysematous gastritis. These two conditions have a similar presentation, and therefore, it is difficult to differentiate the two on imaging. Bi-level positive airway pressure (BiPAP) is a noninvasive intervention for selected patients in respiratory distress. This intervention uses positive airway pressure to prevent endotracheal intubation. The commonly noted side effects of positive airway pressure are dry mouth and oral irritation. This is the first case, to our knowledge, of gastric emphysema directly originating from BiPAP administration. It was diagnosed on imaging as pneumatosis intestinalis and emphysematous gastritis but clinical presentation was benign. The condition resolved immediately after discontinuation of BiPAP.

### ARTICLE HISTORY

Received 30 March 2019  
Accepted 9 May 2019

### KEYWORDS

Gastric emphysema;  
emphysematous gastritis;  
BiPap; noninvasive airway  
pressure; pneumatosis  
intestinalis

## 1. Introduction

Bi-level positive airway pressure (BiPAP) is a noninvasive intervention used in carefully selected patients in respiratory failure. The positive airway pressure can improve ventilation and oxygenation, potentially preventing endotracheal intubation. The commonly noted side effects of positive airway pressure are dry mouth and oral irritation. Gastric emphysema (GE) is a rare medical condition in which air penetrates any layer of the gastric wall (mucosa, submucosa, muscle layer, or serosa) due to a noninfectious source. It is essential to differentiate this from a life-threatening condition known as emphysematous gastritis (EG). These two conditions have a similar presentation, and therefore, it is difficult to differentiate the two on imaging. This is the first case, to our knowledge, of GE directly originating from BiPAP administration.

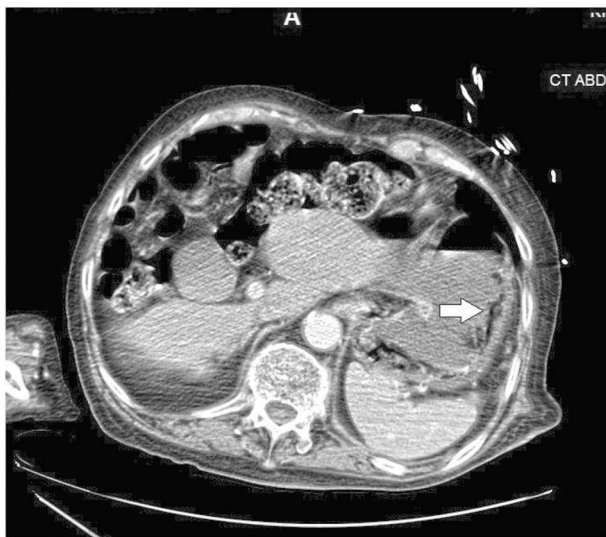
## 2. Case report

A 78-year-old male with a past medical history of benign prostate hypertension, severe constipation, schizophrenia with severe psychosis, and chronic obstructive pulmonary disease was transferred to our hospital after a mechanical fall at his nursing home. On admission, he had a full body computed tomography (CT) including head, maxillofacial, chest, abdomen and pelvis, cervical, thoracic, and lumbar. He was hemodynamically stable and all laboratory tests were within

normal range, except creatine phosphokinase of 3392 U/l. Physical exam was unremarkable.

During hospitalization, the patient was found to be in respiratory distress with use of accessory muscles. The code status of the patient stated not to resuscitate or intubate. The saturation was 93% on room air. Chest x-ray at the time revealed an infiltrate consistent with pneumonia. He was started on empiric treatment with vancomycin and piperacillin-tazobactam for seven days, methylprednisolone, bronchodilators, and non-rebreather mask with FiO<sub>2</sub> of 40% for the treatment of hypoxic respiratory failure and hospital-acquired pneumonia. On hospital day 12, he was found to be in respiratory distress now requiring BiPAP machine. This machine was used for approximately 18 h. The diagnosis of pulmonary embolism was excluded by performing a CT angiogram. An incidental finding of portomesenteric venous gas was noted. Therefore, a CT of the abdomen and pelvis was obtained. This study showed large amounts of stool burden throughout the gastrointestinal tract and thickening of stomach walls (body and fundus) shown in [Figures 1 and 2 \(inset\)](#). This was suggestive of pneumatosis intestinalis and EG.

Due to significant stool burden seen on imaging, patient was digitally disimpacted, and stool softeners and laxatives were administered along with water enema. BiPAP was discontinued and replaced with nasal cannula on high flow oxygen. Despite the apparent EG, our patient was showing significant clinical improvement. Gastroenterology was consulted for



**Figure 1.** CT of the abdomen depicting finding consistent with emphysematous gastritis (axial view).



**Figure 2.** CT of the abdomen depicting finding consistent with emphysematous gastritis (coronal view).

further evaluation and the patient was recommended supportive management and to be treated for GE. Due to lack of a toxic presentation, EG seemed unlikely. An esophagogastroduodenoscopy was postponed until complete respiratory recovery. A CT scan of the abdomen was repeated three days after discontinuation of BiPAP which showed complete resolution of the intramural air in the stomach. The patient was discharged upon improvement of respiratory symptoms and recommended outpatient follow-up. A repeat esophagogastroduodenoscopy was scheduled as an outpatient but he was lost to follow-up.

### 3. Discussion

This appears to be a rare case of GE, most likely BiPAP-induced. Intestinal pneumatosis is the presence of gas in the gastrointestinal tract. It is extremely rare for this entity to occur in the stomach [1]. Figures 1 and 2 show a CT of the abdomen depicting findings consistent with EG. Of note, this patient presented with only respiratory symptoms and not abdominal symptoms, making EG or any other abdominal pathology much less likely. Radiological finding of this patient seemed to be a multitude of differential diagnosis, especially an inflammatory disease process presenting with respiratory distress.

It is crucial to differentiate GE from EG. Oftentimes, there can be some overlap in presentation both clinically and radiologically and differentiating signs can be overlooked. Therefore, a good patient history and physical examination are required for adequate treatment. GE can occur from multiple known possible etiologies like injury to mucosal wall of stomach, ingestion of acidic or alkaline substances, procedural mucosal damage while performing endoscopy, nasogastric tubes, chemotherapy agents, and possible extra gastric injuries to intestines or pulmonary organs while EG is usually due to an infectious cause [1].

GE can present with abdominal discomfort, nausea, vomiting, and/or general gastrointestinal distress [2]. The increased intragastric pressure from excess positive airway pressure along with severe constipation could potentially cause mucosal injury and allowed air into the muscular layers of the stomach [2–4]. Portohepatic gas can be present in both conditions and does not necessarily require surgery [5]. GE in the setting of gastric obstruction or duodenal stenosis has been described in the past but none due to solitary constipation [3,4]. GE is usually managed conservatively with intravenous fluids, pantoprazole, and removal of the inciting factor. This leads to complete self-resolution. In contrast, EG is an acute infection of the stomach wall with gas-forming organisms presenting in systematic toxicity. This condition can carry mortality up to 100% and requires aggressive management with antibiotics and possible surgical intervention [1,4,6].

### 4. Conclusion

GE and EG should be differentiated clinically to provide proper treatment. Once the BiPAP was removed, repeat CT abdomen showed resolution of the GE, pneumatosis intestinalis, and portal venous gas without any targeted antibiotics or unnecessary surgical intervention. This shows that free air in the abdomen does not always require urgent exploratory laparotomy if fatal conditions are clinically excluded. Clinicians should be aware of this condition, its

clinical presentation, radiographic findings, management, and prognosis in order to avoid unnecessary testing and aggressive treatment.

### Acknowledgment

Thanks to Dr. Joseph Bibawy in the Department of Radiology of our institute for providing us with the radiological images.

### Disclosure statement

No potential conflict of interest was reported by the authors.

### ORCID

Fahad Malik  <http://orcid.org/0000-0002-0956-5708>

### References

- [1] López-Medina G, Castillo Díaz de León R, Heredia-Salazar A, et al. Gastric emphysema a spectrum of pneumatosis intestinalis: a case report and literature review. *Case Rep Gastrointest Med.* 2014;2014:1–5.
- [2] Parikh M, Sherid M, Ganipiseti V, et al. Vomiting-induced gastric emphysema and hepatoportal venous gas: a case report and review of the literature. *Case Rep Med.* 2015;2015:1–4.
- [3] Angelino V, Volpicelli G, Cardinale L. Gastric emphysema after intubation. *J Belg Soc Radiol.* 2017;101(1). DOI:10.5334/jbr-btr.812
- [4] D’Cruz R, Emil S. Gastroduodenal emphysema. *J Pediatr Surg.* 2008;43(11):2121–2123.
- [5] Inayat F, Zafar F, Zaman M, et al. Gastric emphysema secondary to severe vomiting: a comparative review of 14 cases. *BMJ Case Rep.* 2018;bcr-2018–226594. DOI:10.1136/bcr-2018-226594
- [6] Pauli E, Tomasko J, Jain V, et al. Multiply recurrent episodes of gastric emphysema. *Case Rep Surg.* 2011;2011:1–3.