

# Diaphragmatic eventration complicated by gastric volvulus with perforation

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Eventration of the diaphragm with gastric volvulus is uncommon. Gastric perforation in these cases is rare and usually associated with acute gastric volvulus with strangulation. We describe a case of diaphragmatic eventration with chronic gastric volvulus with gastric perforation without strangulation in an elderly man.

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In diaphragmatic eventration, permanent elevation of an immobile hemidiaphragm occurs in which peripheral muscular attachment is normal with no interruption in peritoneal or pleural layers. This may lead to displacement of abdominal organs, especially the stomach. Gastric volvulus is an uncommon complication of eventration; perforation of the stomach in gastric volvulus is rare, with very few cases reported in the literature.<sup>1-3</sup> We present a case of chronic mesentero-axial gastric volvulus with gastric perforation without strangulation.

## Case report

A 50-year-old man presented to the emergency department with a 2-day history of abdominal pain radiating to the left shoulder, abdominal distension, non-bilious vomiting, obstipation and dyspnoea. There was no history of chest pain, fever, oliguria or haematemesis. He was a chronic smoker, with a history of essential hypertension and dyspepsia for many years. General physical examination revealed a dry coated tongue, tachycardia, blood pressure of 150/90, tachypnoea and decreased air entry on the left side of the chest. On abdominal examination, he had diffuse abdominal distension with rigidity, rebound tenderness mainly in the upper abdomen, masking of liver dullness and absent bowel sounds. Blood investigation showed leucocytosis of 12 300 with neutrophil predominance (86%), and normal serum electrolytes and renal function tests. A chest X-ray revealed pneumoperitoneum, raised left diaphragm and right-sided mediastinal shift (Fig. 1). Contrast-enhanced computed tomography (CT) of the chest and abdomen confirmed the presence of pneumoperitoneum and also showed significant elevation of the left hemidiaphragm along with the displacement of the stomach, colon and omentum in to the left thoracic cavity, raising suspicion of eventration of the left hemidiaphragm and gastric volvulus (Figs 2 and 3). In addition, there was a significant

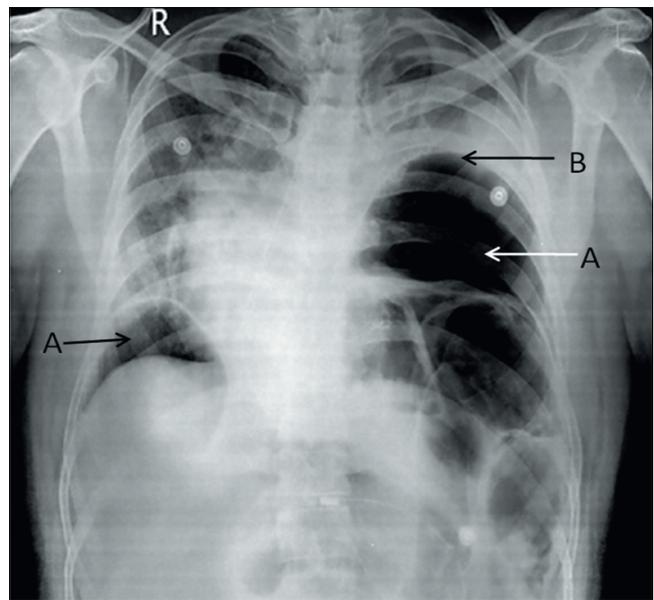


Fig. 1. X-ray of the chest showing pneumoperitoneum (A) and highly raised left hemidiaphragm (B).

shift of the mediastinum towards the right side. As there was no leak of orally administered contrast on the CT scan, the site of the perforation could not be localised. The patient was prepared for emergency surgery. On exploratory laparotomy, there was eventration of the left hemidiaphragm along with the mesentero-axial gastric volvulus with the distal body and antrum lying in the left chest cavity along with the transverse colon, omentum and spleen. There was a small 5 mm perforation on the anterior wall of the midbody of the stomach. Reduction of the gastric volvulus and other viscera, plication of the diaphragm, gastric perforation repair and anterior gastropexy were performed, along with peritoneal lavage and drainage. The postoperative period was complicated by hypertension, left pleural effusion and bronchospasm, managed by nitroglycerine infusion, pleural tap and aminophylline infusion, respectively. He was discharged in a stable condition on day 8 postoperatively.

## Discussion

Diaphragmatic eventration refers to permanent elevation of an immobile hemidiaphragm in which peripheral muscular

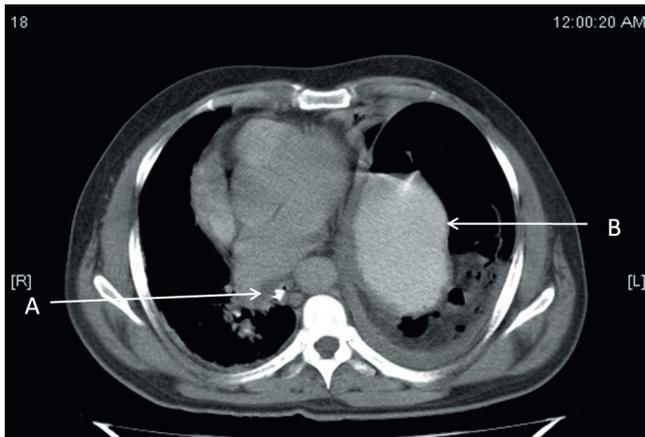


Fig. 2. Contrast-enhanced CT scan of the chest showing marked mediastinal shift towards the right side including oesophagus with nasogastric tube inside (A) and stomach displaced into the left chest (B).



Fig. 3. Coronal reconstruction (a) and 3D reconstruction (b) of contrast-enhanced CT scan of the chest showing raised left hemidiaphragm (A) with distended stomach (B) and omentum (C) displaced into the left chest cavity, with nasogastric tube (black arrows) coiled in the fundus of the stomach.

attachment is normal with no interruption in peritoneal or pleural layers. It may be congenital or acquired owing to phrenic nerve dysfunction. Phrenic nerve dysfunction may result from adjoining inflammation, trauma (birth, external or surgical) or involvement by neoplastic pathology. The congenital type is usually present in childhood. In adults, however, it tends to remain undetected as it is mostly asymptomatic. The patient may present with chest complaints, e.g. respiratory distress and dyspnoea on exertion, or abdominal complaints, e.g. epigastric pain, belching and dysphagia. Eventration may be further complicated by acute gastric volvulus, chronic gastric volvulus or chronic recurrent volvulus of the splenic flexure of the colon.<sup>4</sup> Perforation in gastric volvulus is rare; only a few cases have been reported.<sup>1-3</sup> Perforation may be secondary to strangulation, which is more common with organo-axial volvulus. The incidence of

strangulation may be as high as 28% in acute gastric volvulus.<sup>5</sup> Perforation may also result from trauma by the tip of the nasogastric tube,<sup>3</sup> emphasising the need to remain careful while inserting nasogastric tube in such a patient. In our patient, perforation was secondary to a gastric ulcer that most probably developed secondary to chronic stasis.

In primary gastric volvulus, the diaphragm is usually intact and pathology lies in the abnormal fixation of the stomach owing to lax attachments. Usually, this is the mesentero-axial type, in which the stomach rotates around a line passing parallel to the gastrohepatic omentum. This is seen in association with wandering spleen or congenital asplenia. This type presents with chronic or intermittent symptoms. Although uncommon, this variant has also been reported in association with diaphragmatic eventration.<sup>6</sup> Secondary gastric volvulus is seen in association with diaphragmatic hernia or eventration and is usually of the organo-axial type in which the stomach rotates along its long axis and usually presents as acute volvulus. Our patient had secondary gastric volvulus but of the mesentero-axial type. Most probably, it was a chronic volvulus and manifested owing to gastric ulcer perforation.

Asymptomatic patients with diaphragmatic eventration may be managed conservatively. Symptomatic patients, however, require surgical intervention, especially those with complications such as acute gastric volvulus. The surgical approach may be open, laparoscopic or thoracoscopic and plication with or without reinforcement by mesh is usually the surgical procedure, with excellent results.

In conclusion, the presence of features of visceral perforation in a patient with eventration of the diaphragm should raise the suspicion of not only acute gastric volvulus with gastric strangulation but also of an uncommon cause such as perforation owing to nasogastric tube and peptic ulcer perforation of the stomach, conditions which may occur in chronic gastric volvulus without strangulation. Management in such cases without strangulation may be more straightforward than with gastric necrosis, with less postoperative morbidity.

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