

# Pneumomediastinum, pneumothorax, and subcutaneous emphysema due to duodenal ulcer

Muhammad Abdullah, FCPS, FRCS, Mohammed H. Al-Akeely, MBBS, CABS, Abdulaziz A. Al-Mustafa, MBBS, FACHARTZ.

## ABSTRACT

يعد حدوث الريح الصدرية، والريح المنصفية، أو النفاخ تحت الجلد بسبب قرحة الاثنى عشر المثقوبة حالة نادرة. نعرض هنا حالة لمريض يبلغ من العمر 23 عام يعاني من نفاخ تحت الجلد في الرقبة، وريح صدرية، وريح منصفية بدون اضطرابات تنفسية. أظهرت الاستقصاءات وجود قرحة الاثنى عشر الفعالة، لكن مع عدم وجود هواء داخل البطن، أو وجود تسرب الاثنى عشر وتم تشخيص احتمال وجود ثقب مسدود في الاثنى عشر وتحسنت حالة المريض بعد العلاج الطبي.

The presence of pneumothorax, pneumomediastinum, or cervical subcutaneous emphysema due to perforated duodenal ulcer is a rare presentation. We report a 23-year-old man who showed bilateral cervical subcutaneous emphysema, pneumomediastinum, and pneumothorax with no respiratory abnormality. He was found to have active duodenal ulcers, but no detectable pneumoperitoneum or duodenal leak. A sealed perforation from the duodenal ulcers was suspected, and he fully improved after conservative management.

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From the Departments of General Surgery (Abdullah, Al-Akeely), and Cardiothoracic & Vascular Surgery (Al-Mustafa), College of Medicine, King Saud University, King Saud Medical Complex (University Surgical Unit), Riyadh, Kingdom of Saudi Arabia.

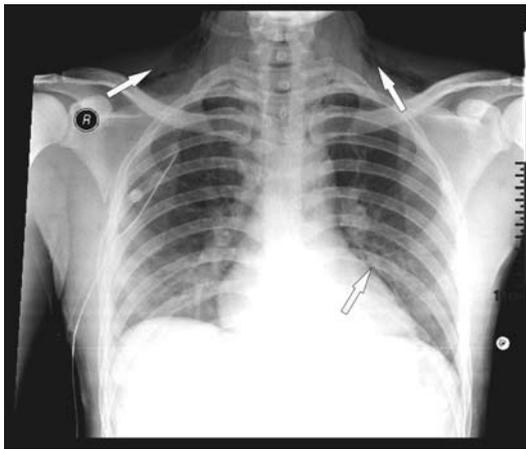
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Address correspondence and reprint request to: Dr. Muhammad Abdullah, Department of General Surgery, King Saud University, PO Box 341436, Riyadh 11333, Kingdom of Saudi Arabia. Tel. +966 (1) 4355555 Ext. 1283. Fax. +966 (1) 4679493. E-mail: khokhar7@hotmail.com

air has moved through tissues into the subcutaneous plane. However, pneumothorax, pneumothorax, and cervical emphysema in various combinations have been reported following perforated duodenal ulcer,<sup>1</sup> iatrogenic duodenal injury,<sup>2</sup> unsuccessful endoscopic retrograde cholangiopancreatography (ERCP),<sup>3,4</sup> and large bowel perforation.<sup>5,6</sup> We report an unusual case of cervical emphysema, pneumothorax, and pneumomediastinum with active duodenal ulcers but no proven perforation in a young man to highlight that investigation of an asymptomatic abdomen is required when no cause of pneumothorax or cervical emphysema is found.

**Case Report.** A 23-year-old man presented to the emergency room at King Saud Medical Complex, Riyadh, Saudi Arabia with complaints of chest pain, shortness of breath, and nausea for 2 days. He was a smoker but had no other symptoms on systemic inquiry, and no medical history. Clinical examination revealed stable vital signs with normal body temperature and 98% oxygen saturation on room air. Chest examination showed equal bilateral normal sounds with bilateral moderate surgical emphysema in the lower neck. Abdominal examination was unremarkable. Total leucocyte count was 18,000/mm<sup>3</sup>, other hematological and biochemical laboratory work up was within normal limits. Chest radiograph showed inflated lungs with pneumomediastinum and neck subcutaneous emphysema (Figure 1). An emergency CT of the neck, chest, and upper abdomen with intravenous (IV) and oral contrast were carried out showing extensive emphysema in the antero-lateral part of the neck, and an extensive pneumomediastinum with minimal apical bilateral pneumothorax. There was no contrast leak in the mediastinum or abdomen. He was admitted with a suspicion of spontaneous esophageal rupture. A chest tube was placed on the right side, which made him feel better immediately. A broad-spectrum antibiotic was started. Upper gastrointestinal (GI), Gastrografin study was carried out on the third post admission day showing no leak of contrast. A CT chest and abdomen with IV contrast were repeated on the following day revealing no surgical emphysema, minimal gas shadow

The simultaneous presence of pneumothorax, pneumomediastinum, and cervical subcutaneous emphysema is a serious and rare presentation. It usually indicates that there has been a breach of an air containing structure in the neck, pleural cavity, or mediastinum and



**Figure 1** - Initial chest radiograph with chest tube (arrows show areas of extensive air spread).

in the mediastinum, no pneumothorax, and no lung lesion. The CT abdomen was normal. An upper GI endoscopy was performed on the tenth day, which showed a normal esophagus and stomach, but there were 2 active ulcerations approximately 0.8 x 2 cm each at the anterior and supero-posterior wall of the duodenal bulb. Multiple biopsies were taken from the 2 ulcers, which were unremarkable. He also underwent fiber-optic bronchoscopy on day 12, which was normal. He made an uneventful recovery after treatment and remained well on regular follow-up.

**Discussion.** The earliest report of perforated duodenal ulcer with pneumomediastinum and surgical emphysema was published in 1937.<sup>7</sup> Later, similar reports appeared in the surgical literature consistently.<sup>1,8</sup> The clinical findings in some of these presented patients raised the suspicion of spontaneous rupture of the esophagus, similar to our patient. However, in most patients there were clear-cut abdominal signs, which pointed to the diagnosis. Pneumoperitoneum was present in some patients in addition to pneumothorax or pneumomediastinum, while in others pneumoperitoneum could not be detected. All these patients required exploratory laparotomy to reach a diagnosis and for management.

Various authors have postulated the mechanism of intra-peritoneal or retroperitoneal air reaching the mediastinum and thorax. It has been suggested that free air in the peritoneum under tension may directly diffuse through the inflamed or injured peritoneum into the mediastinum.<sup>8</sup> It is also postulated that air in the peritoneal or retroperitoneal space may travel along the visceral space through the diaphragmatic hiatus by following the esophagus into the mediastinum and bronchovascular sheaths.<sup>9</sup> The spread of air from the

retroperitoneal space to the retropleural space, and then to the mediastinum has been discussed in colonic perforation,<sup>10</sup> a similar mechanism of spread may occur in perforation of posterior duodenal ulcers.

The presentation of our patient was different from the previous reports because the abdomen was symptom free, and neither free abdominal gas nor perforated ulcer was detected. The extensive air penetration was spontaneous without any preceding procedure. The active duodenal ulcers were not an indication for surgery. The patient was managed conservatively and made an uneventful recovery.

The chest and plain abdominal radiographs are carried out initially to evaluate patients with an acute onset of pneumothorax, pneumomediastinum, and subcutaneous emphysema. Obvious signs of peritonitis with or without pneumoperitoneum need exploration. In equivocal cases, CT neck, chest, and abdomen should be carried out to delineate the source of free air. Upper GI contrast study using water-soluble contrast, diatrizoate meglumine (Gastrografin) may define an oesophageal, gastric, or duodenal leak, but a small leak, or sealed perforation may be missed in 10% of cases.<sup>3</sup> Esophagoscopy and bronchoscopy are the next steps to evaluate further and plan the management. However, despite previous studies, 5-10% of perforations are not detected initially, and 1-2% is even missed on repeat studies after 12-24 hours.<sup>3</sup> The reported patient had all these investigations revealing no perforation. The upper GI endoscopy showed duodenal ulcers, which could be the source of a sealed perforation.

In conclusion, this case report stresses the need to investigate an asymptomatic abdomen urgently, when no clear cause of pneumothorax, pneumomediastinum, or subcutaneous emphysema is found.

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