

Subcutaneous emphysema, pneumomediastinum, pneumoretroperitoneum, and pneumoperitoneum secondary to colonic perforation during colonoscopy

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Colonoscopy is a common procedure for the diagnosis and treatment of colorectal disease. Traditionally, sedation and monitoring during colonoscopy have been performed by gastroenterologists. However, due to the recent increase in the aging population as well as in the number of complex procedures being performed, anesthesiologists become involved in anesthesia care to ensure patient safety and comfort.

Although colonoscopy is considered as a relatively safe procedure, it can cause serious complications such as bowel perforation at a frequency of 0.07 to 0.10% [1].

We report a rare case of colonoscopic perforation resulting in extensive subcutaneous emphysema, pneumomediastinum, pneumoretroperitoneum and pneumoperitoneum.

A 71-year-old woman (63 kg, 163 cm) underwent a colonoscopy for abdominal discomfort. She had a history of hysterectomy 20 years ago, and no current medical problems. Her laboratory test values and chest radiography were normal. Colonoscopy was performed under intravenous sedation with midazolam 4 mg, and SpO₂ was maintained at 98–99%. During the procedure, sedation and monitoring were performed by the gastroenterologist and nurse. When the colonoscope was advanced to the colosigmoid junction, perforation occurred and the procedure was terminated immediately. Air was used as an insufflation agent with a low setting for the air - flow regulation. Subsequently, the patient showed massive swelling of the face and neck. She complained of mild abdominal pain, and physical examination revealed a slightly distended abdomen with diffuse tenderness. Vital signs were within normal limits, and no signs

of respiratory distress were observed. Chest, and abdominal X-ray, and CT scans showed severe pneumoperitoneum, pneumoretroperitoneum, pneumomediastinum, and subcutaneous air in the anterior chest wall, posterior back muscles, and neck (Fig. 1).

An emergency operation was performed 3 hours after the perforation. There was extensive subcutaneous emphysema with crepitus in the neck and face, although, the patient did not complain of dyspnea. Baseline vital signs showed blood pressure of 162/66 mmHg, heart rate of 90 beats/min, and SpO₂ of 100% on 6 L/min of oxygen by facial mask. General anesthesia was induced with thiopental 5 mg/kg and rocuronium 0.8 mg/kg. Although laryngoscopy revealed grossly emphysematous pharyngeal tissues around the vocal cords and a Cormack-Lehane grade of 2 with cricoid pressure, we were able to advance an I.D. 7.0 mm endotracheal tube with a stylet. Anesthesia was maintained with sevoflurane in oxygen at 2 L/min. Mechanical ventilation was applied with a tidal volume of 500 ml, peak inspiratory pressure of 24 cmH₂O, and end-tidal CO₂ of 30–32 mmHg. A baseline arterial blood gas analysis showed the following results: pH, 7.37, PaCO₂, 36.0 mmHg, PaO₂, 323.0 mmHg, and SaO₂, 100%. A 15 mm perforation in the posterior colosigmoid junction was detected, and segmental resection and anastomosis were performed. During the operation, the patient's vital signs, airway pressure, and end-tidal CO₂ remained stable. The patient was transferred to the intensive care unit, and a follow-up radiograph showed no significant changes. She was successfully weaned from mechanical ventilation and extubated on postoperative day 1. Her subcutaneous emphysema markedly resolved

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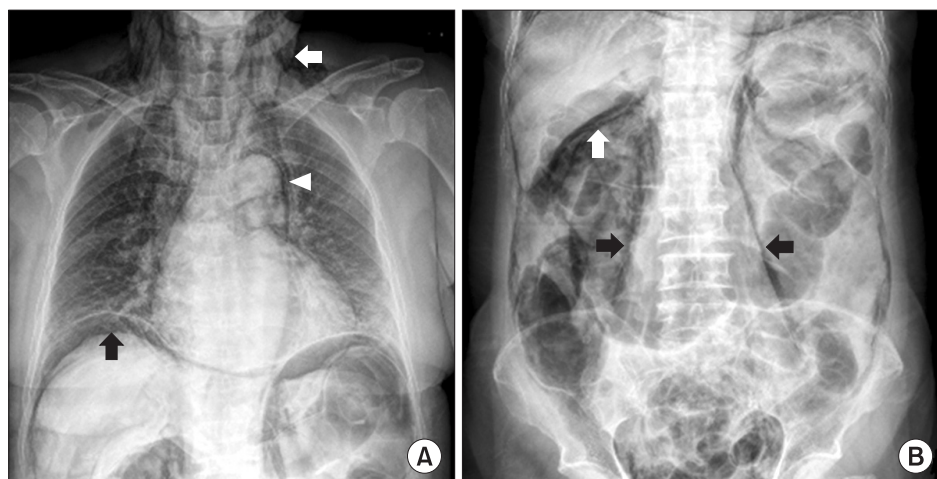


Fig. 1. (A) Chest radiograph shows marked subcutaneous emphysema (white arrow), pneumomediastinum (arrow head) and subdiaphragmatic free air (black arrow). (B) Abdominal radiograph shows pneumoperitoneum (white arrow) and retroperitoneal free air outlining the psoas muscle (black arrow).

on the second postoperative day and she was transferred to the general ward.

Subcutaneous emphysema with pneumomediastinum is a recognized but uncommon complication of colonoscopy. In this case, our patient experienced a posterior colonic perforation and developed the whole spectrum of extraluminal air.

Regarding the mechanism of extraluminal air diffusion, the spaces between the retroperitoneum, mediastinum, and subcutaneous tissue are anatomically continuous [2]. When perforation occurs, intraluminal compressed air may escape into either the peritoneum or retroperitoneum. The air in the retroperitoneum travels along fascial planes, mesentery, and large vessels and through the diaphragmatic hiatus, and it further spreads to the mediastinum and subcutaneous tissues [2,3]. Pneumothorax can develop when the mediastinal parietal pleura ruptures or the pneumoperitoneum extends to the intrapleural space through diaphragmatic fenestrations [4]. If gas insufflation continues to the perforated colon, it can cause life-threatening tension pneumothorax and acute respiratory failure requiring intubation and thoracentesis [2-4]. Symptoms can occur immediately or several hours after perforation, therefore, continuous observation by appropriately trained staff is required. In our case, the patient did

not develop a pneumothorax immediately after the perforation, however, follow-up chest X-rays were performed to assess for any changes.

The presentation symptoms may include periorbital swelling, pneumoscrotum, and pneumopericardium [3]. Therefore, perforation should be suspected in patients who developed sudden subcutaneous emphysema or unremitting abdominal pain following colonoscopy.

In the present case, we postponed the extubation to avoid potential airway obstruction from the associated pharyngeal swelling. Emphysematous pharyngeal tissue can hinder direct visualization of the vocal cords and causes upper respiratory tract obstruction [5]. Therefore, we should be prepared for the possibility of difficult airway management and avoid the use of nitrous oxide in patients with multiple pathologically air-filled spaces.

As the demand for anesthesia care for colonoscopy increases, awareness and management of its potential complications become essential. An understanding of the pathophysiological consequences of intestinal perforation following colonoscopy, and awareness of the associated clinical signs and symptoms are important to provide early diagnosis and proper management.

References

1. Panteris V, Haringsma J, Kuipers EJ. Colonoscopy perforation rate, mechanisms and outcome: from diagnostic to therapeutic colonoscopy. *Endoscopy* 2009; 41: 941-51.
2. Ball CG, Kirkpatrick AW, Mackenzie S, Bagshaw SM, Peets AD, Temple WJ, et al. Tension pneumothorax secondary to colonic perforation during diagnostic colonoscopy: report of a case. *Surg Today* 2006; 36: 478-80.
3. Webb T. Pneumothorax and pneumomediastinum during colonoscopy. *Anaesth Intensive Care* 1998; 26: 302-4.
4. Kipple JC. Bilateral tension pneumothoraces and subcutaneous emphysema following colonoscopic polypectomy: a case report and discussion of anesthesia considerations. *AANA J* 2010; 78: 462-7.
5. Chien GL, Soifer BE. Pharyngeal emphysema with airway obstruction as a consequence of laparoscopic inguinal herniorrhaphy. *Anesth Analg* 1995; 80: 201-3.