SUBCUTANEOUS EMPHYSEMA, PNEUMOTHORAX, PNEUMOMEDIASTINUM, AND PNEUMOPERITONEUM DURING COLONOSCOPIC BALLOON DILATION: A CASE REPORT

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A 77-year-old woman underwent colonoscopic balloon dilatation for colonic stricture 1 year after laparoscopic anterior resection of sigmoid colon cancer. During the balloon dilatation, panfacial swelling and apnea were noted. Emergency endotracheal intubation was undertaken. Chest X-ray revealed diffuse subcutaneous emphysema and bilateral pneumothorax. We discuss the possible mechanism and management of this uncommon complication during therapeutic colonoscopy.

Key Words: airway obstruction, colonoscopy, pneumomediastinum, pneumothorax, subcutaneous emphysema
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Colonoscopy is used worldwide for diagnosis and treatment of colorectal disease. The possible complications include perforation, bleeding and infection. We report a rare but potentially fatal upper airway complication in the operating room during therapeutic colonoscopy.

CASE PRESENTATION

A 77-year-old woman, American Society of Anesthesiologists class III, was scheduled for colonoscopic balloon dilatation under intravenous general anesthesia. She had received laparoscopic anterior resection for sigmoid colon cancer 1 year previously. However, lower gastrointestinal series X-ray radiography revealed postoperative anastomosis stricture. In the operating room, we gave the patient continuous infusion of propofol (10 mg/kg/hr), and the procedure was performed in the lithotomy position. The surgeon inserted the colonoscope about 15 cm above the anal verge. The balloon dilatation was performed under 5 atm pressure for 3 minutes and shifted to 8 atm for 5 minutes. During the procedure, we found that oxygen saturation decreased from 99% to 96% when the surgeon dilated the stricture. Meanwhile, bilateral neck swelling appeared within a few seconds and the patient gradually developed cyanosis. Mask ventilation was tried initially, but we could not find chest wall movement, and there was no waveform on the capnograph. Acute upper airway obstruction was diagnosed. We performed emergency intubation without any other induction agent. After intubation, the patient continued spontaneous breathing under sevoflurane anesthesia. Portable chest X-ray revealed left-side pneumothorax and diffuse upper trunk subcutaneous emphysema (Figure 1). The surgical procedure was canceled.

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During the following hour, the patient had stable hemodynamics. The neck subcutaneous emphysema gradually subsided and she was extubated in the post-anesthetic recovery unit. No peritoneal signs were noted postoperatively. Chest computed tomography was performed on the next day, which revealed bilateral pneumothorax, upper trunk subcutaneous emphysema, pneumomediastinum and pneumoperitoneum (Figures 2 and 3). The patient received conservative treatment without chest tube insertion. Daily serial chest X-ray examination showed gradual resolution of the pneumothorax, and the patient was discharged 5 days later.

**DISCUSSION**

Colonoscopy is widely used for diagnosis and treatment of colorectal disease. The incidence of major complications, such as bowel perforation, ranges from 0.2% to 2.0% depending on the complexity of the procedure [1]. The risk of pneumothorax is much lower than that of bowel perforation. Maunder et al described the possible mechanism for the development of subcutaneous emphysema, pneumomediastinum and pneumothorax after bowel perforation [2]. There are four compartments in the neck, thorax and abdominal soft tissue, and they are separated by fascial planes. The pre-tracheal layer of the deep cervical fascia encloses the trachea and esophagus, and is fused with the pericardium. It follows the esophagus into the retroperitoneal soft tissue. Thus, there are potential spaces in the neck, thorax and abdomen, and air that arises in one compartment might follow the potential fascial plane to another.

By reviewing endoscopic dilatation in Crohn’s disease, bowel perforation was reported in 13 patients (2%), whereas no cases of pneumothorax were reported [3]. Our patient rapidly developed panfacial swelling during therapeutic balloon dilatation for colonic stricture. According to Brayko et al [4], serosal tearing occurs at a mean pressure of 202 ± 15 mmHg, and mucosal tearing at 226 ± 14 mmHg. Although the insufflation pressure during colonoscopy of our patient was <18 mmHg, the strictured region might have

**Figure 1.** Portable chest X-ray showed pneumomediastinum (arrows) and pneumothorax (arrow heads).

**Figure 2.** Chest computed tomography (lung window) showed bilateral pneumothorax (white arrows), pneumomediastinum (white arrow heads) and subcutaneous emphysema (black arrow).

**Figure 3.** Chest computed tomography (lung window) showed pneumoperitoneum (arrows) near the liver.
been torn during balloon dilatation. Air could have dissected the colonic wall as a result of the pressure gradient traveling along the mesentery to the retroperitoneal space [5]. As long as we continued insufflation, the air would eventually reach the mediastinum. Perforation of the mediastinal pleura results in pneumothorax; therefore, it might be advisable to turn off the insufflation during balloon dilatation to prevent the entrance of continuous air into the submucosal layer, and to stop the air insufflation as long as pneumothorax is found during the procedure.

Painless colonoscopy is now frequently performed for diagnosis or treatment, although the risk of bowel perforation is well known by physicians. Rapid upper airway obstruction is the most devastating complication of the procedure, and can threaten the patient's life within a few minutes. In such cases, the patient needs emergency intubation to secure the airway and timely treatment if tension pneumothorax develops [6]. The case reported here demonstrates that it is wise to check the anterior chest wall crepitus and bilateral breathing sounds as long as mild desaturation is detected by pulse oximetry. Tracheal intubation should not be delayed if the upper airway is compromised.

REFERENCES
大腸鏡氣球擴張術引發之氣腹、雙側氣胸、皮下氣腫以及縱膈腔氣腫：案例報告

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一位 77 歲女性患有乙狀結腸癌，於 1 年前接受腹部鏡前位切除術，因為腸道狹窄，於本院接受大腸鏡氣球擴張術。術中發現腹部脹脹，合併上呼吸道阻塞，緊急插管以保護呼吸道。X 光發現雙側氣胸，腦幹皮下氣腫。於本文，我們討論此併發症可能之機制，以及預防因應之措施。

關鍵詞：呼吸道阻塞，大腸鏡，縱隔腔氣腫，氣胸，皮下氣腫

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