

Pneumothorax, pneumomediastinum, pneumoperitoneum and extensive subcutaneous emphysema resulting from endoscopic mucosal resection secondary to colonoscopy: A case report

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Abstract. Rectal perforation is an unusual complication of therapeutic colonoscopy. The present study reports the case of a patient with a rare manifestation of pneumothorax, pneumomediastinum, pneumoperitoneum and extensive subcutaneous emphysema that resulted from an endoscopic mucosal resection following a colonoscopy of the rectum. Only 3 cases of colonic perforation and 1 case of rectal perforation have been described previously, of which the clinical diagnoses and treatments were varied, and no results of follow-up studies were reported. In the present study, dyspnea and neck swelling were acute signs of extraluminal air that resulted from rectal perforation. Computed axial tomography was an effective diagnosis method, and is recommended for the early recognition of colorectal perforation. Appropriate management and a close follow-up are crucial for optimal results.

Introduction

Previously, patients presenting with benign adenoma and colorectal neoplasms at the T1 stage were advised to undergo an endoscopic mucosal resection (EMR) (1). EMR is generally considered to be an endoscopic alternative to the surgical resection of mucosal and submucosal neoplastic lesions and intramucosal cancers (2). Various complications of EMR, including hemorrhages and perforations, have been reported. Alternatively, manifestations such as pneumothorax, pneumomediastinum, pneumoperitoneum, pneumoretroperitoneum and subcutaneous emphysema following EMR are extremely rare. At present, only 3 cases of colonic perforation and 1 case

of rectal perforation have been described in the literature, and the clinical diagnoses and treatments were varied, with no additional results of follow-up studies being reported (3-6). The present study reports that for rectal perforation, which is revealed by an acute clinical manifestation, early imaging recognition by a computerized axial tomography (CT) scan and appropriate management is associated with optimal results. The results of a follow-up study that occurred 4 months subsequently suggested that the recovery of the patient was comprehensive. Written informed consent was obtained from the patient.

Case report

In May 2014, a 51-year-old male underwent a colonoscopy at the First Affiliated Hospital of Kunming Medical University (Kunming, China). In June 2014, the patient returned to the same hospital for an EMR of rectal adenoma. The patient possessed a previous medical history of a brain abscess close to the left basal ganglia region that was treated with ceftriaxone sodium for 14 days. The colonoscopy was performed in the left lateral position while the patient was sedated using 1.5 mg/kg intravenous propofol. The colonoscopy revealed a lobulated rectal adenoma, 1.5 cm in diameter, at the 4-6 o'clock position, located 5 cm from the anal verge, and the superficial margin was clear (Fig. 1A). An endoscopic mucosal resection using a transparent cap (EMR-C) (2,6) was performed with the intent to cure (Fig. 1B) (6,7). Following the EMR, no residual tumors at the periphery or any definite perforations were revealed using magnified observation (Fig. 1C). Subsequently, 2 titanium clips were used for wound hemostasis (Fig. 1D). No complications, such as massive bleeding or perforations, were identified during colonoscopy.

Following the EMR, the patient suddenly suffered from breathing difficulties. At this point, the patient developed acute subcutaneous emphysema of the neck (Fig. 2), posterior chest wall, and anterior and lateral abdominal walls. Following the intake of oxygen (FiO₂, 41%) for 5 min, the dyspnea symptoms demonstrated no sign of improvement. An emergency chest X-ray examination was performed and a bilateral pneumothorax was indicated (Fig. 3). Additionally, a

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Key words: endoscopic mucosal resection, rectal perforation, early recognition, appropriate management, close follow-up

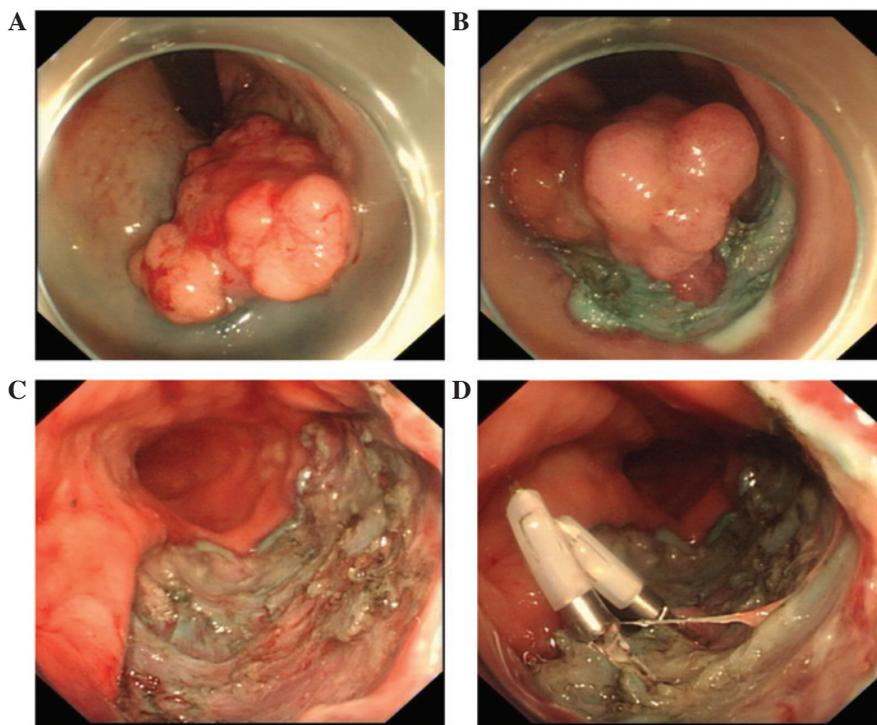


Figure 1. (A) Rectal adenoma 5 cm from the anal verge, 1.5 cm in size. The lesion was lobulated and elevated, with normal mucosa. (B) The adenoma was snared off in the standard fashion of endoscopic mucosal resection. (C) The lesion was removed. (D) Titanium clips were used for wound hemostasis.



Figure 2. The patient presenting with neck swelling.

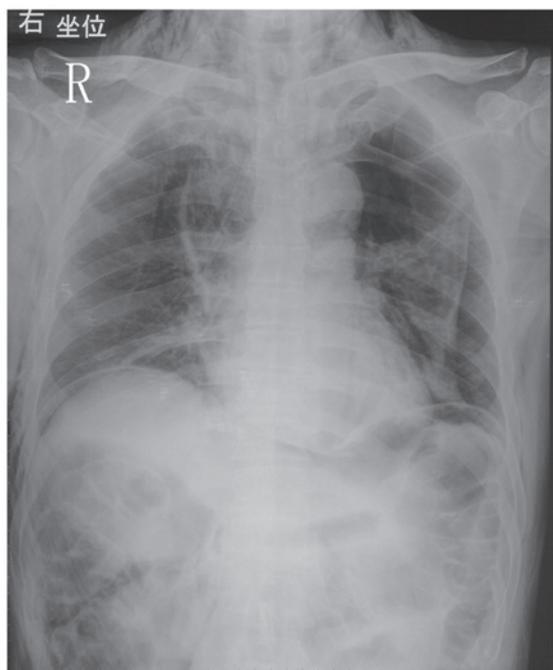


Figure 3. Chest radiograph exhibiting pneumothorax.

CT scan of the chest, abdomen and pelvis was performed. The CT scan results also demonstrated a bilateral pneumothorax, occupying ~70 and 20% of the left and right thoracic cavities,

respectively (Fig. 4A), pneumomediastinum (Fig. 4B), pneumoperitoneum (Fig. 4C), and pneumoretroperitoneum extending down to the presacral space (Fig. 4D). Extensive cervical subcutaneous emphysema was also identified (Fig. 4E).

The laboratory data revealed that the white blood cell count was 11.5×10^{12} cells/l (normal range, $4.0-10.0 \times 10^{12}$ cells/l), and that the C-reactive protein level was 65 mg/l (normal

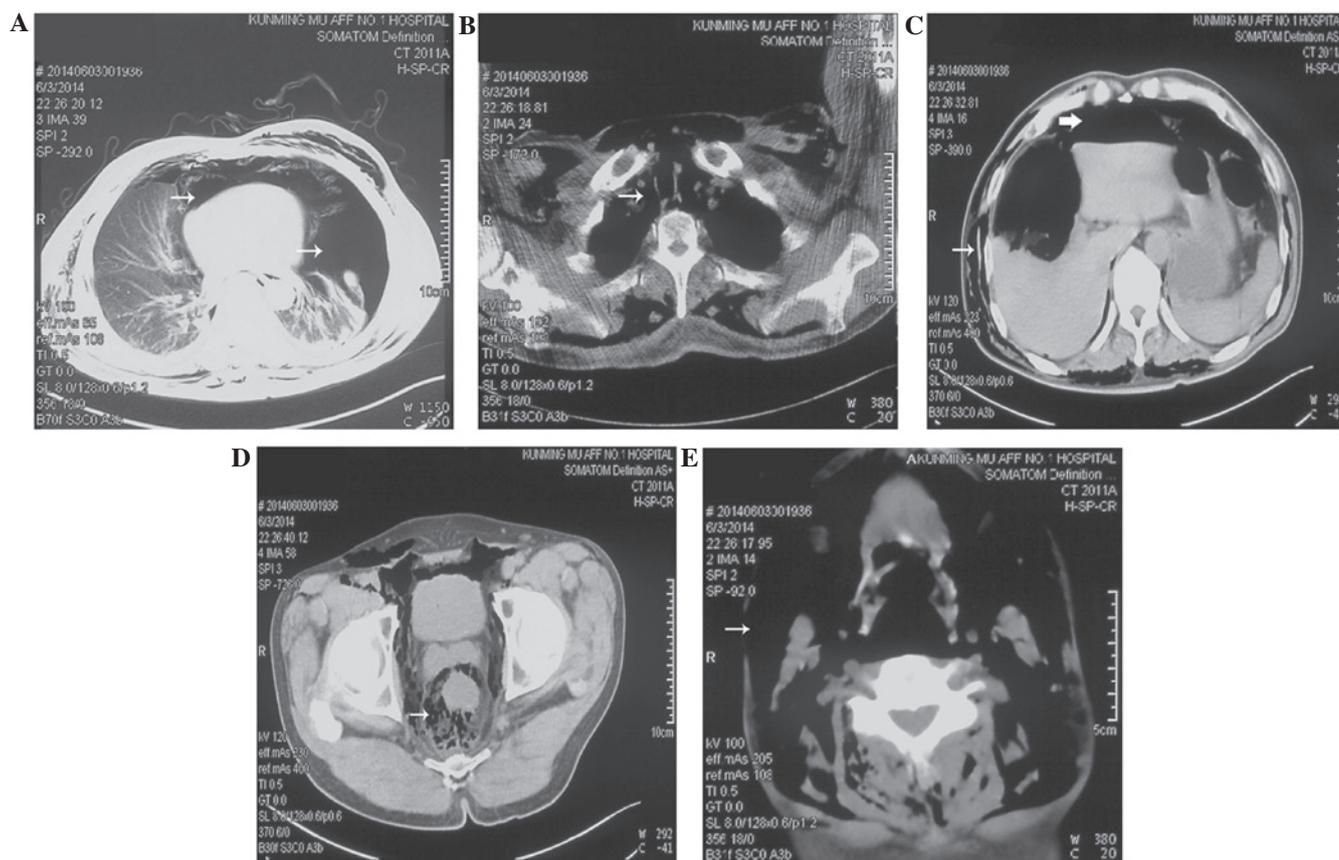


Figure 4. (A) CT scan of the chest demonstrating a bilateral pneumothorax, occupying ~70 and 20% of the left and right thoracic cavity, respectively (thin arrow). (B) Axial CT scan of the chest demonstrating pneumomediastinum (thin arrow). (C) Abdominal CT disclosed pneumoperitoneum (thick arrow), and abdominal wall subcutaneous pneumatosis (thin arrow). (D) CT scan demonstrating pneumatosis around the presacral space (thin arrow). (E) CT scan of neck exhibiting cervical subcutaneous emphysema (thin arrow). CT, computed tomography.

range, 0-3.3 mg/l). Due to the dyspnea symptoms, intercostal drainage of the left pneumothorax was performed immediately. A follow-up chest X-ray exhibited a resolving pneumomediastinum and the resolution of the pneumothorax 1 day later. As no peritonitis developed, the patient was managed conservatively with intravenous fluids and intravenous antibiotics (ceftriaxone sodium; 2 g/day) for 72 h prior to the gradual re-introduction of oral fluid and food. The pneumoperitoneum, pneumoretroperitoneum and subcutaneous emphysema were almost resolved within 7 days, and the CT reexamination and physical examination revealed a rapid, but not comprehensive, recovery. The white blood cell count and C-reactive protein levels decreased to normal. The excised specimen was histologically diagnosed as tubular adenoma, with focal carcinoma that was limited to within the mucosal layer. No residual tumor was found at the basal region of the tumor specimen. Following discharge, the patient reported no complaints of dyspnea or hematochezia in the monthly telephone follow-ups. Subsequent to 4 months of follow up, a colonoscopy demonstrated that the rectal mucosal wound and scar was healing (Fig. 5), and a CT scan provided no evidence of subcutaneous emphysema or interstitial pneumatosis (Fig. 6).

Discussion

The incidence of colorectal perforation following colonoscopy has been reported to range between 0.16% in diagnostic

colonoscopies and 0.44% in therapeutic colonoscopies (8). The major causes of perforation include excessive air insufflation, instrumental trauma and the improper use of electrocautery, while the factors that increase the risk of perforation include old age, medical comorbidity and therapeutic procedures, such as polypectomy, pneumatic dilation and endoscopic mucosal resection (9-11). The majority of the signs of colonic perforation are abdominal symptoms, such as acute peritonitis. However, the current patient presented with bilateral pneumothorax and subcutaneous emphysema as early signs of a rectal perforation following EMR, which caused serious dyspnea symptoms and neck swelling. In the present patient, pneumothorax was first indicated by an emergency chest X-ray; however, additional CT imaging tests comprehensively revealed the rare manifestations of pneumothorax, pneumomediastinum, pneumoperitoneum, pneumoretroperitoneum and extensive subcutaneous emphysema. Thus, CT is effective and recommended for early recognition in cases presenting with colorectal perforation.

There are varying mechanisms through which extraluminal air may reach the various body compartments, including undue instrument manipulation, air insufflation or improper use of diathermy (5,9,10). In the present study, extraluminal air entered the body due to rectal perforation following EMR. The retroperitoneal air resulted from a direct retroperitoneal space in rectal perforation, then the extraluminal air accumulated and passed along the mesentery to the retroperitoneum. Subsequently, air travelled along the fascial planes to enter the mediastinum,

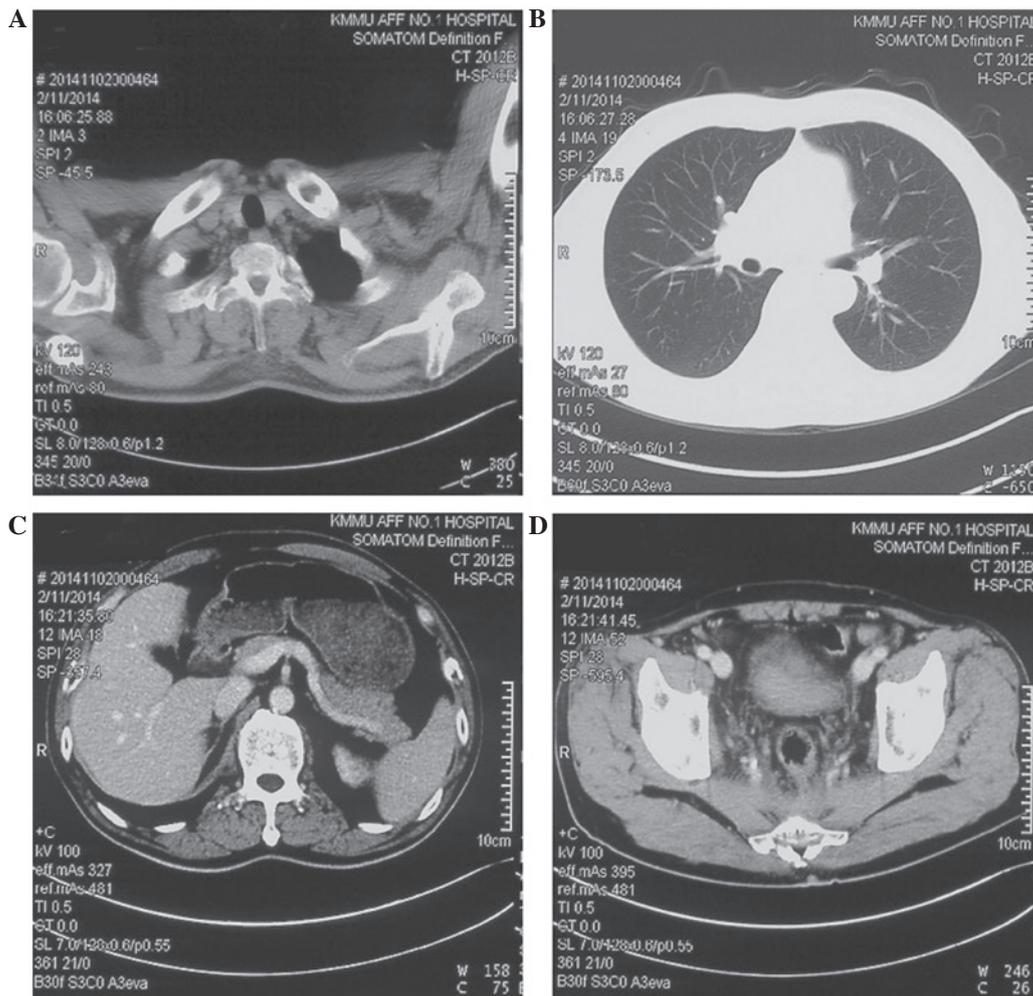


Figure 5. (A) CT scan of neck presenting no subcutaneous emphysema. (B) CT examination of lung demonstrating no pneumomediastinum. (C) Abdominal CT demonstrating no pneumoperitoneum. (D) Pelvic CT examination disclosed no pneumatosis. CT, computed tomography.



Figure 6. Colonoscopy demonstrating that the rectal mucosal wound and scar were healing.

which caused the pneumomediastinum. A subsequent rupture of the mediastinal pleura allowed air to decompress into the pleural cavity and caused the pneumothorax (5,12).

The choice of conservative or surgical treatment for iatrogenic colonic perforation remains controversial (13-15). Finding air in the pleural and abdominal cavity may be an

early sign of a life-threatening condition. In the present case, due to the serious dyspnea, intercostal drainage was performed immediately to improve the breathing difficulties. For patients that present with colonic perforation and acute peritonitis, a fecal diversion with a colostomy was suggested (10). In the present study, the choice of conservative treatment for the pneumoperitoneum was based on the following factors: First, the abdominal pain was mild and localized, and no complaint of acute peritonitis was observed; and second, the movement of air from the peritoneal space is usually considered as non-infectious and may be treated conservatively (3). In the present patient, the pneumoperitoneum, pneumoretroperitoneum and subcutaneous emphysema were almost resolved within 7 days of treatment. A CT reexamination and physical examination revealed a rapid and uneventful recovery, and a follow-up 4 months subsequently revealed a comprehensive recovery without subcutaneous emphysema or interstitial pneumatosis.

In conclusion, the present study reports a case of rectal perforation following EMR. Dyspnea and neck swelling are acute signs of extraluminal air resulting from rectal perforation. CT examination is a fast and effective method for the early and comprehensive assessment of the condition of a patient. Appropriate management and close follow-up are crucial for optimal results.

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