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Complication Forum

Iatrogenic pyriform sinus perforation during endoscopic ultrasonography

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ABSTRACT

Summary of Event: A 65-year-old woman underwent endoscopic ultrasonography (EUS) to evaluate the gastric submucosal tumor. The EUS scope was inserted into the esophagus after two attempts. A neck computed tomography (CT) scan showed a pneumomediastinum and an air bubble deep in the neck, suggesting an esophageal rupture. The patient was hospitalized and maintained conservative treatment including broad-spectrum antibiotics and withholding oral feeding.

Teaching Point: Endoscopists should consider an imaging modality when a patient complains of moderate to severe neck pain after an upper endoscopy. Prompt surgical management should be considered in patients with a delayed diagnosis (> 24 hours), those with signs of systemic toxicity, and those who have eaten between the time of the procedure and when the perforation was detected.

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Keywords: Endoscopic ultrasonography; Iatrogenic perforation; Pyriform sinus

Introduction Event Details

A 65-year-old woman visited our institution for an incidental finding of gastric submucosal tumor. The patient had undergone an esophagogastroduodenoscopy (EGD) at a local clinic and was diagnosed with an approximately 2-cm-sized submucosal tumor on the anterior wall of the antrum. Endoscopic ultrasonography (EUS) was planned for a further evaluation of the gastric submucosal tumor. She was taking triazolam (0.25 mg/day) for insomnia. The EUS examination began after sedative drugs were administered. The EUS scope did not pass due to resistance when it was first inserted along the pyriform sinus. After two attempts, there was a mild bleeding in the oral cavity. Another endoscopist retried, and the EUS scope was inserted successfully into the esophagus. After finishing the EUS examination, EGD was performed to inspect the injury status of the oropharyngeal mucosa. There was no obvious mucosal injury site, and no current bleeding was found; the procedure was finished thereafter (Fig. 1). The endoscopist who performed the procedure recommended that the patient should return to the hospital immediately if she felt any neck discomfort. The patient complained of throat pain on her way home after the

procedure had finished, and she visited the Department of Otorhinolaryngology. A physical examination showed tenderness with crepitus on the left side of the pharynx. A neck computed tomography (CT) scan showed a pneumomediastinum and an air bubble deep in the neck, suggesting an esophageal rupture; however, no definite perforation site and no mediastinitis were detected (Fig. 2A). The patient was hospitalized to manage the suspicious pyriform sinus perforation. An initial laboratory test showed leukocytosis (white blood cell [WBC] count, 15,060 cells/mm³) and she had a fever of 38.1°C with chills on hospital day 1. Conservative treatment including broad-spectrum antibiotics and withholding oral feeding was maintained. On hospital day 2, the patient was transferred to the Department of Chest Surgery to manage the suspicious pyriform sinus perforation with a pneumomediastinum. On hospital day 3, her symptoms, including neck pain and chills, improved gradually; furthermore, the fever subsided and the WBC count had decreased to 8,980 cells/mm³. A follow-up neck CT scan performed on hospital day 7 showed resolution of the pneumomediastinum and air bubbles (Fig. 2B). An esophagography was performed on hospital day 8 and showed no abnormal leakage in the entire esophagus (Fig. 3). After confirming no mucosal

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defect in the esophagus or oropharynx, she started to drink water followed by a soft diet. The patient tolerated an oral diet without any specific discomfort and was discharged on hospital day 9. She was followed-up at the outpatient clinic 2 weeks later and was in good condition.

Fig. 1. Esophagogastroduodenoscopy (EGD) findings performed immediately after endoscopic ultrasonography. EGD shows mild bleeding at pyriform sinus.

Discussion

Although EGD is a widely used diagnostic and therapeutic modality for upper gastrointestinal disease, there are procedure-related adverse events, including cardiopulmonary, sedation-related, and infectious complications, as well as perforations and bleeding. Among these complications, perforations are rare but can be life-threatening.¹ The procedure-related perforation rate of the esophagus is between 0.008% and 0.11%, and the mortality rate varies between 4.2% to 17%.^{2–4} Iatrogenic perforations frequently occur during upper endoscopy at the normal anatomic narrowing, with the majority being located in the hypopharynx secondary to exertion of the force of passing the endoscope through the hypopharynx-cervical esophageal junction.⁵ The pyriform sinus is a subsite of the hypopharynx, but no case reports have been published regarding a pyriform sinus perforation related to a EUS procedure. The mucosa of the pyriform sinus is extremely thin and fragile, especially on the lateral side, where only a small muscle layer separates it from the carotid sheath in the neck.⁶ The treatment options for pyriform sinus rupture occurring during an endoscopic procedure include conservative management and surgical treatment. Conservative management includes broad-spectrum antibiotics and withholding oral feeding. This approach may avoid the morbidity associated with surgery. The types of surgical treatments available include operative drainage, primary closure of the perforation, and/or muscle flap reinforcement.⁷ It remains controversial that which management option is most appropriate for a pyriform sinus rupture. Multiple factors should be reviewed and checked before deciding on the treatment method for a pyriform sinus rupture. These factors include the

Fig. 2. Neck computed tomography (CT) scan. (A) CT scan on hospital day 1 shows a large amount of pneumomediastinum and deep neck air bubble (arrows). (B) CT scan on hospital day 7 shows resolution of pneumomediastinum and air bubble.

Fig. 3. Esophagography (gastrografin) performed on hospital day 8. (A) Anteroposterior view. (B) Lateral view. Esophagography shows no abnormal leakage in entire esophagus.

Fig. 4. Treatment of algorithm for pyriform sinus rupture. Modified from the figure of Zenga et al⁷ (*Am J Otolaryngol.* 2015;36:678-85) with original copyright holder's permission.

size, location, and etiology of the perforation, time to diagnosis, oral intake prior to diagnosis, imaging findings, and signs of systemic toxicity.

Some retrospective studies have analyzed the treatment outcomes of cervical esophageal and hypopharyngeal perforations. Zenga et al⁷ showed the factors favoring surgical treatment. They reviewed 28 patients with cervical esophageal or hypopharyngeal perforations. Patients who had eaten between the time of the perforation and the diagnosis, those for whom there was at least 24 hours between the injury and the diagnosis, and those who showed signs of systemic toxicity were at higher risk of failure for non-surgical management; a surgical intervention such as drainage should be considered in these cases.⁷ A study by Abbas et al⁸ involving 119 patients with an esophageal perforation demonstrated that conservative management may be successful in selected cases with a low morbidity and mortality if favorable radiological and clinical characteristics are present. Imaging findings are also important to guide the diagnosis and treatment of a perforation. Another study reviewed 17 esophageal perforation cases and reported patient-related factors for treatment.⁹ In this study, signs of systemic illness, such as leukocytosis and oral intake prior to diagnosis, were the most significant prognostic factors for failure of conservative management.

Based on these previous studies, we propose a treatment algorithm that was modified from a figure in Zenga et al⁷ for a pyriform sinus rupture (Fig. 4).

Prevention

The pyriform sinus has a high risk of perforation during upper endoscopy. Particularly, EUS is prone to damaging the mucosa of the gastrointestinal tract because it is a side-viewing scope with a sharp tip made of stainless steel. Therefore, careful endoscopic manipulation is required, because excessive manipulation and force when inserting the endoscope can increase the risk of a pyriform sinus rupture. Endoscopists, particularly beginners and trainees who have little experience with endoscopy, should be

aware of this.

Teaching Point

Endoscopists should consider an imaging modality, including CT, when a patient complains of moderate to severe neck pain after an upper endoscopy. Prompt surgical management should be considered in patients with a delayed diagnosis (> 24 hours), those with signs of systemic toxicity, and those who have eaten between the time of the procedure and when the perforation was detected.

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

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