

Acquired Pharyngeal Diverticulum after Anterior Cervical Fusion Operation Misdiagnosed as Typical Zenker Diverticulum

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A pharyngeal diverticulum is a rare complication of an anterior cervical discectomy and fusion (ACDF). We present a case of a pharyngeal diverticulum after an ACDF, which was misdiagnosed as a typical Zenker diverticulum. A 54-year-old woman presented with dysphagia and a sense of irritation in the neck following C5 through C7 cervical fusion 3 years prior. The patient underwent open surgery to resect the diverticulum with concurrent cricopharyngeal myotomy. An ACDF-related diverticulum is difficult to distinguish from a typical Zenker diverticulum.

Key words: 1. Pharynx
2. Discectomy
3. Zenker diverticulum

Case report

A 54-year-old woman presented with a complaint of dysphagia and a sense of irritation in the neck. Endoscopy and a videofluoroscopic swallow study showed a diverticulum (Fig. 1A, B), and neck computed tomography (CT) revealed a 2.5×1.2-cm lesion at the left lateral aspect of the upper esophagus with connection to the esophageal lumen (Fig. 1A). Initially, surgical correction was elected due to a diagnosis of a Zenker diverticulum. However, because the patient had a history of an anterior cervical discectomy and fusion (ACDF), we evaluated a pre-ACDF neck CT scan to determine whether the ACDF affected the development of the diverticulum. There were no findings consistent with a Zenker diverticulum on the neck CT (Fig. 1B). Moreover, the patient had no history of pre-operative dysphagia. We changed the diagnosis from a Zenker diverticulum to an ACDF-related diverticulum and re-planned the operation ac-

ording to this change in diagnosis.

The operation was performed under general anesthesia. A left oblique neck incision was made along the left sternocleidomastoid muscle. We found a 2.5×1.5-cm diverticular sac with scar tissue and adhesion adjacent to the hardware, which included the previous screw and plate. The sac was the true diverticulum and comprised the whole esophageal structure, including the muscle layer. The screw and plate seemed to be intact without dislodgement. There was no sign of infection around the hardware (Fig. 2). After adhesiolysis, the diverticulum was excised using a DST Series TA stapler (Covidien, Mansfield, MA, USA) and Vicryl 4-0 suture reinforcement. We then attempted to apply reinforcement using the surrounding muscle, but obtaining an intact muscle flap was difficult due to the scarring caused by the previous operation. Therefore, we decided to use a negative-pressure wound therapy (NPWT) system. The upper half of the wound was not closed, and a

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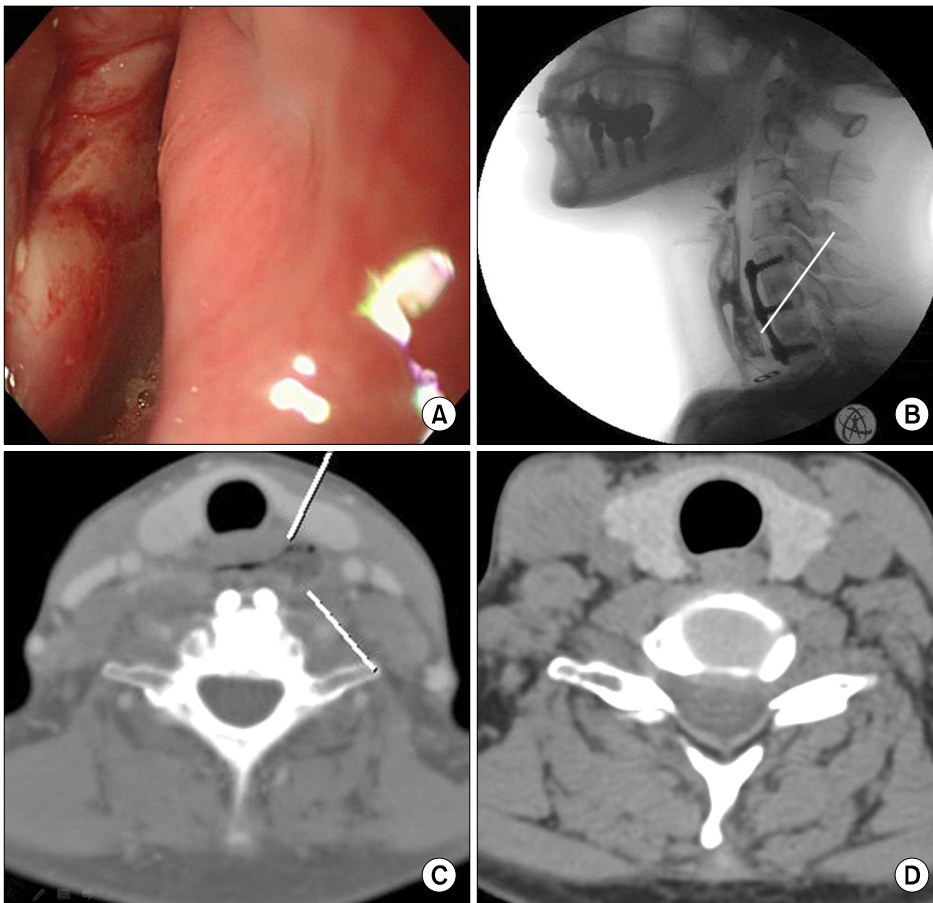


Fig. 1. (A) Endoscopy and (B) video-fluoroscopic swallow study showed a diverticulum. (C) Preoperative neck CT reveals a 2.5-cm pouch with communication with the esophageal lumen. (D) Pre-anterior cervical discectomy and fusion neck CT shows no finding consistent with a Zenker diverticulum. CT, computed tomography.



Fig. 2. Operation findings include a dense adhesion between the diverticulum and the previous anterior cervical fusion site. The previous plate and screw show no dislocation. The diverticulum is located on the posteriolateral side of the esophagus adjacent to the screw and plate, unlike a typical Zenker diverticulum. The diverticulum end, held with ring forceps, exhibits wall thinning and is about to perforate.

NPWT system (CuraVAC; CGBio, Seongnam, Korea) was applied. The patient underwent an esophagogram on postoperative day 7, and no leakage was found; she

started a general diet on that day. After confirmation of complete repair site healing on postoperative day 9, the neck wound was closed with CuraVAC removal. The patient was discharged on the following day (postoperative day 10). The pathologist reported that the diverticulum included all layers of the esophageal wall, including the muscle layer (Fig. 3).

Discussion

Various surgical complications can occur following an ACDF, and the overall complication rate may reach 3.9% [1]. Among these complications, the incidence of esophageal problems is reportedly <31%, and these have been well documented despite their rarity. However, pharyngo-esophageal diverticulum after an ACDF has not been well documented because of its extreme rarity; fewer than 20 cases have been reported since its first description by Goffart et al. in 1991 [2,3]. In particular, an ACDF can easily be

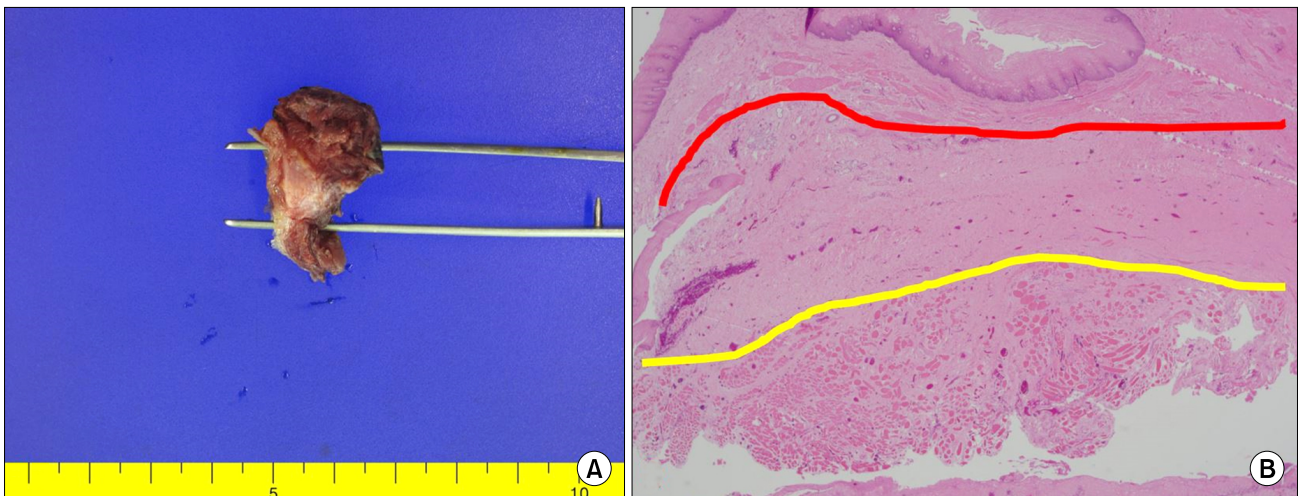


Fig. 3. (A) Gross photograph of the diverticulum and (B) microscopic findings of the diverticulum show that it involved all layers of the esophageal wall, including the muscle layer.

misdiagnosed as a Zenker diverticulum, which is the most common pharyngo-esophageal diverticulum.

The ACDF-related diverticulum has a different pathophysiology than the Zenker diverticulum. The Zenker diverticulum is a pulsion diverticulum, which is a false diverticulum that involves the esophageal mucosa but not the muscular layer. It is thought to result from weakness of the muscle layer, so only the mucosal layer is pulled out to form a pouch. In contrast, the ACDF-related diverticulum is a traction diverticulum, a product of traction force generated by dense scar tissue. This traction force restricts a certain point of the tissue while the other portion moves freely, resulting in development of a traction diverticulum involving all layers of the esophageal wall. In the present case, we found adhesion and scar tissue around the diverticulum, which might have resulted from traction force at the previous surgery site. The diverticulum also included a muscle layer.

There are two treatment considerations according to the pathophysiology. The first is whether or not an endoscopic procedure is optimal for the treatment of an ACDF-related diverticulum. Endoscopic treatment of an esophageal diverticulum is now widely performed. However, endoscopic diverticulectomy is associated with some difficulties in treating an ACDF-related pharyngeal diverticulum. Dense, thick scar tissue between the diverticulum and the esophageal wall makes engagement of the endostapler challenging. Additionally, because the ACDF-related

diverticulum is not located in the posterior wall (unlike a typical Zenker diverticulum), positioning the endoscope to expose the diverticulum can be problematic [4]. Furthermore, because patients with an ACDF have difficulty in neck extension, the instrumental approach can be an unfavorable option. Additionally, hardware removal should be considered in cases of dislodgement and infection. Open surgery seems to be appropriate in the case of an ACDF-related diverticulum. The second consideration is whether or not cricopharyngeal myotomy is necessary. Allis et al. [5] postulated that although the pathophysiology of these ACDF-related diverticula appears to be distinct from that of Zenker diverticula, cricopharyngeal myotomy may decrease pulsion forces and prevent diverticulum formation. However, the postulation of Allis et al. [5] lacks additional supporting evidence, and because the barrier between the thin mucosa and hardware is absent due to cricopharyngeal myotomy, the possibility of postoperative fistula is increased. Because an ACDF-related diverticulum is a traction diverticulum, reinforcement by the surrounding muscle rather than by the cricopharyngeal myotomy is required to prevent rupture of the repair site due to irritation by hardware. However, it is difficult to obtain an intact muscle flap because of scarring from the previous operation and adhesion. We thus decided to use an NPWT system. The NPWT system is widely used in the treatment of complex wound problems, such as mediastinitis, fas-

ciitis, and open-wound defects. We thought that the NPWT system would facilitate healing of the repair site and provide a barrier between the tissue and the hardware during complete wound healing. Therefore, we applied the NPWT system for 1 week until the repair site had healed completely, and then closed the wound. We recommend use of an NPWT system if muscle reinforcement is difficult.

Additionally, an important consideration is whether or not the hardware should be removed. Hardware was removed in more than 50% of cases reported globally. However, if there is no infection surrounding the hardware or the likelihood of spinal instability is low, the hardware remains in place in most cases. In the majority of reported cases, the decision regarding hardware removal was taken following consultation with the neurosurgeon. We also believe that sufficient preoperative communication with the neurosurgeon is necessary.

In conclusion, an ACDF-related diverticulum can be easily misdiagnosed as a typical Zenker diverticulum without correlation with a previous ACDF. Although pharyngeal diverticulum is a rare complication of an ACDF, the possibility of an esophageal diverticulum should not be overlooked. If accurate history taking is performed and the history of an ACDF is taken in-

to account, the optimal surgical policy for the treatment of an ACDF diverticulum can be selected.

Conflict of interest

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

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