Staple line reinforcement to reduce leakage in open surgery for Zenker's diverticulum? A case report and literature review

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Abstract

A linear stapler was used to reduce the leakage rate during a Zenker's diverticulum diverticulectomy. However, staple line reinforcement was not used, and leakage occurred. The efficacy of staple line reinforcement in the literature was unclear; however, reinforcement may be necessary for Zenker's diverticulum cases.

Introduction

Zenker's diverticulum (ZD) is a relatively rare esophageal disorder occurring in 2 per 100,000 people annually.[1] ZD is a pseudodiverticulum occurring in Killian's triangle, a weak area at the posterior pharyngoesophageal wall between the inferior constrictor of the pharynx and the cricopharyngeal muscle.[2] ZD is treated with open or endoscopic surgery, although which treatment is better is controversial.[3] In open surgery, cervical diverticulectomy with cricopharyngeal myotomy was the standard treatment for decades. However, accompanying leakage is a concern.[4,5] A linear stapler is often used for closure during diverticulectomies to reduce the leakage rate.[5,6] The procedure can be completed with or without staple line reinforcement, of which the efficacy remains unclear. Herein, we present a case of post-diverticulectomy leakage when a linear stapler was used without reinforcement and discuss the effects of reinforcement described in the literature.

Case report

A 65-year-old woman presented with left-side neck swelling and discomfort. Endoscopy and computed tomography (CT) revealed accumulated food in a diverticulum on the left side of the cervical esophagus (Figs. 1a and 1b). Gastrointestinal contrast examination showed that the diverticulum size was approximately 3 cm (Fig. 1c). From these results, the patient was diagnosed with ZD and underwent a diverticulectomy with cricopharyngeal myotomy.

An approximately 7 cm cervical skin incision was made along the left sternocleidomastoid muscle. The ZD was identified after exposing the thyroid, internal jugular vein, and vagal nerve. After pulling up the diverticulum pouch, a diverticulectomy was conducted using a 45-mm linear stapler without staple line reinforcement (Figs. 2a, 2b, and 2c). Intraoperative endoscopy did not reveal stenosis of the esophagus. The patient started a soft diet on postoperative day 2; however, fever developed on postoperative day 4, and blood examination showed an increased inflammatory reaction. Although a gastrointestinal contrast examination did not reveal anastomotic leakage on postoperative day 4 (Fig. 3a), a CT scan revealed a minor anastomotic leakage on postoperative day 5 (Fig. 3b). Subsequently, the patient fasted and was treated with intravenous fluid and antibiotics for 5 days from postoperative day 5. The patient was again

put on a soft diet from postoperative day 10, owing to a decreased inflammatory reaction on the blood examination and body temperature. The patient was discharged on postoperative day 17. There was no recurrence of diverticulum or stenosis on the esophagus approximately 1.5 years after surgery.

Discussion

We observed leakage following a diverticulectomy of a small diverticulum using a linear stapler. A linear stapler is widely used during diverticulectomies and may decrease the leakage rate compared to a manual suture.[6] Based on this, we used a linear stapler and considered staple line reinforcement to be unnecessary. However, anastomotic leakage occurred.

The diverticulectomy-related articles from 2000 to 2015 are summarized in Table 1. Six articles reported that a linear stapler without staple line reinforcement was used in 307 patients,[6,7] but the patients from one article about an unknown anastomotic procedure were excluded. Thus, leakage occurred in 6 of 277 patients (2.2%) reported in five publications. Conversely, two articles reported staple line reinforcement in 87 patients,[8,9] and leakage occurred in 3 (3.4%). Only four articles reported leakage treatments; three reported conservative treatments, and one reported reoperation.[6,7,10,11] Leakage occurred with and without the staple line reinforcement, and there was no difference in the leakage rate between the procedures. However, a meta-analysis showed that staple line reinforcement decreased gastrointestinal anastomosis leakage.[10,11] ZD is a pseudodiverticulum without a muscular layer. Hence, the staple line consists of only the mucosa and submucosa after a diverticulectomy.[2] The absence of a muscular layer may lead to a weak staple line, increasing leakage risk. This suggests that reinforcement may reduce leakage in ZD diverticulectomies.

There are some limitations to our study. First, we did not reinforce the staple line. Second, we identified that the staple line was the weakest site (and the potential cause of the leakage), but we could not identify the leakage point. Third, we observed only one case where leakage occurred without reinforcement. Hence, the usefulness of strengthening the staple line should be further explored, as well as the best reinforcement method, such as oversewing or a continuous suture.

In conclusion, diverticulectomy leakage occurred with and without staple line reinforcement, and no difference in the leakage rate was found between the procedures. However, reinforcement may be necessary to decrease leakage in ZD diverticulectomies based on the gastrointestinal anastomosis literature. Further evidence is required to confirm these findings.

Acknowledgments

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Conflict of Interest

The authors declare that they have no competing interests.

Authors' contributions

KTas, MK, and SWL performed the operation and the patient's perioperative care. JA, SS, KTan, and TS designed and drafted the manuscript. KTas, KH, YI, RT, and MK collected and interpreted the patient data. KTan, TS, SWL, and KU reviewed and revised the manuscript. KU supervised the patient's treatment and the report writing. All authors have approved the final manuscript.

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Figure legends

Figure 1. Representative images before surgery

(a) Endoscopy showed food accumulation in a cervical esophagus diverticulum (yellow arrowhead). The blue arrowhead indicates another esophageal lumen. (b) CT showed that the diverticulum continued to the esophagus (yellow arrowhead). (c) Gastrointestinal contrast examination showed contrast medium accumulation in the diverticulum (yellow arrowhead). Scale bar: 3 cm.

Figure 2. Representative images during surgery

(a) A picture of the ZD root (white arrowhead). (b) The diverticulectomy was conducted with a linear stapler (white arrowhead). The suture for the traction of ZD was tracked during diverticulectomy (black arrowheads). (c) The esophageal staple line after diverticulectomy (white arrowhead).

Figure 3. Representative images after surgery

(a) The contrast medium leakage was not detected by gastrointestinal contrast examination. A yellow arrowhead indicates the part of the diverticulectomy. (b) CT revealed that air was outside the anastomotic part, detecting the minor leakage (yellow arrowhead).

Figure 1

Figure 2

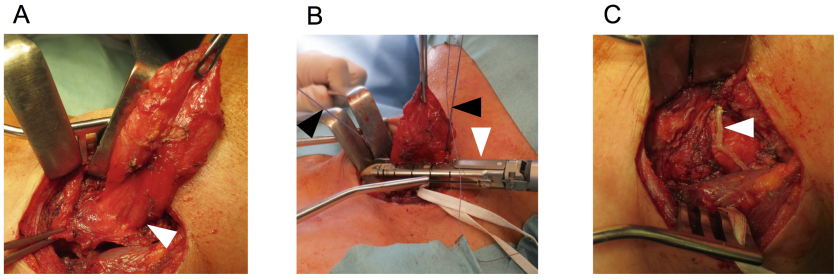

Figure 3