Occult Early Squamous Cell Carcinoma in Zenker’s Diverticulum Treated With Diverticulectomy Followed by Additional Esophagectomy With Free Jejunal Reconstruction: A Case Report

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A 63-year-old man was evaluated for a 20-year history of dysphagia and vomiting. Barium-swallow esophagography showed a Zenker’s diverticulum at the upper end of the esophagus. Esophagogastroduodenoscopy revealed the diverticulum about 20 cm from the incisors. There was no mucosal inflammation or irregularity in the diverticulum. Computed tomography showed that the diverticulum was about 8 cm in size. There was no lymphadenopathy around the esophagus. Because the patient's symptoms were worsening, we performed diverticulectomy using a linear stapling device and cricopharyngeal myotomy. The mucosa of the resected specimen had no macroscopically abnormal lesions. However, an area unstained by iodine that widely involved the surgical margin was recognized at pathologic examination. Pathologic findings revealed squamous cell carcinoma invading the lamina propria mucosa with inflammatory cell infiltration. In addition, the pathologic surgical margin was widely positive. However, a remnant tumor lesion was not detected by postoperative esophagogastroduodenoscopy. Biopsies near the staple line were negative. After obtaining informed consent, we performed resection of the cervical esophagus including the proximal stump of the diverticulum and cervical lymphadenectomy approximately 4 months after the primary...
operation as an additional surgery. Reconstruction was performed by free jejunal transplantation with microvascular anastomosis. The patient was discharged on postoperative day 45. Pathologic examination revealed no malignant lesion in the resected specimen, and radical cure was confirmed.

Key words: Early esophageal carcinoma – Free jejunal reconstruction – Zenker’s (pharyngoesophageal) diverticulum

The first pharyngoesophageal diverticulum was described in 1769 by Abraham Ludlow, and Zenker’s name was attributed to it after his description of series of cases in 1878.1 The main symptoms are dysphagia and regurgitation, and secondary symptoms such as weight loss and halitosis may occur with negative effects on quality of life.2,3 Symptomatic patients need treatment. We herein report a case of symptomatic Zenker’s diverticulum accompanied by occult mucosal esophageal squamous cell cancer that became apparent by postoperative pathologic examination. This patient initially underwent diverticulectomy with cricopharyngeal myotomy. Although the surgical margin was extensively positive, the patient was successfully managed by additional esophageal resection with free jejunal transplantation.

Case Presentation

A 63-year-old man was admitted to our hospital with a 20-year history of dysphagia and vomiting. He had smoked 20 cigarettes daily for 43 years and drank 180 mL whiskey daily for >30 years. His medical history included tuberculosis, hepatitis C, and pulmonary emphysema. Physical examination was unremarkable, and laboratory test results were within normal limits. Barium-swallow esophagography showed a diverticulum at the upper end of the esophagus (Fig. 1a and 1b). Esophagogastrroduodenoscopy revealed the diverticulum about 20 cm from the incisors (Fig. 1c). There was no inflammation or irregularity of the mucosa in the diverticulum (Fig. 1d). Computed tomography showed that the diverticulum was about 8 cm in size and located on the right side in the back of the esophagus. There was no lymphadenopathy around the esophagus (Fig. 2a–2d). Because the patient’s dysphagia had been worsening, we performed diverticulectomy with cricopharyngeal myotomy (Fig. 3a and 3b). The diverticulum was cut using a linear stapling device, while confirming the presence of the esophageal lumen with esophagogastrroduodenoscopy (Fig. 3c and 3d). The postoperative course was uneventful, and the patient left our hospital on postoperative day 9.

The resected specimen contained a diverticulum of 10.6 × 7.3 cm in diameter and no macroscopically abnormal lesions in the mucosa (Fig. 4a). However, iodine staining at pathologic examination revealed an extensive unstained area that reached the proximal resection margin (Fig. 4b). Pathologic findings revealed squamous cell carcinoma invading the lamina propria mucosa (pT1a-LPM) with inflammatory cell infiltration (Fig. 4c and 4d). Pathologically, the surgical margin was widely positive. No lymphatic or blood vessel invasion was present (pathologic Ly and v factors).

Repeat esophagogastrroduodenoscopy with narrow band imaging (NBI) after the first operation revealed no remnant malignant lesions around the surgical stump. An endoscopic biopsy specimen from the mucosa around the staple line showed no malignant cells. After discussing various additional management techniques with the patient, including follow-up, radiotherapy, chemotherapy, and surgery, we obtained informed consent to perform an additional operation. Thus, during the fourth month after the primary operation, we resected the cervical esophagus including the proximal stump of the diverticulum and performed cervical lymphadenectomy. Reconstruction was accomplished by free jejunal transplantation with microvascular anastomosis. Although the patient had pneumonia and slight recurrent nerve paralysis postoperatively, he was discharged on postoperative day 45. Pathologic examination showed no malignant lesions in the resected specimen, and radical cure was confirmed. Throughout the postoperative period and at the 24-month follow-up, the patient was alive without tumor recurrence.

Conclusion

Zenker’s diverticulum is the rarest type of diverticulum in the digestive tract, with a prevalence of
0.01% to 0.11% in the general population and an incidence of 1.8% to 2.3% in patients with dysphagia.4,5 Moreover, squamous cell carcinoma within Zenker’s diverticulum has very rarely been reported, with an incidence of 0.3% to 0.5%.6,7 Carcinoma in Zenker’s diverticulum is probably caused by chronic irritation and inflammation due to food and liquid stasis. Reported risk factors for the development of carcinoma in Zenker’s diverticulum include cigarette smoking, alcohol consumption, old age, male sex, genetics, a long-standing history of symptoms, and a larger diverticulum.8,9 Furthermore, carcinoma should be suspected if a patient exhibits sudden changes in the severity of symptoms such as dysphagia or aphagia or if a patient develops alarm symptoms such as hemoptysis, hematemesis, or local pain.10

Careful examination by esophagogastroduodenoscopy should be performed prior to any definitive surgical procedure. However, carcinoma in Zenker’s diverticulum is infrequently diagnosed by preoperative examination and is more often incidentally

Fig. 1 Findings of the upper gastrointestinal series. (a and b) Barium-swallow esophagography showed a diverticulum at the upper end of the esophagus. Esophagogastroduodenoscopy revealed the diverticulum about 20 cm from the incisors. (c) Black arrow indicates the true esophageal lumen. (d) There was no inflammation or irregularity of the mucosa in the diverticulum.

Fig. 2 Computed tomography imaging. (a–d) Computed tomography showed that the diverticulum was about 8 cm in size and located on the right side in the back of the esophagus. There was no lymphadenopathy around the esophagus.
Fig. 3 Operative findings: (a and b) Diverticulectomy with cricopharyngeal myotomy was performed. (c and d) The diverticulum was cut using a linear stapling device, while confirming the presence of the esophageal lumen with esophagastroduodenoscopy.

Fig. 4 Macroscopic and pathologic findings. (a) The macroscopic findings of the resected specimen. (b) Iodine staining at pathologic examination revealed an extensive unstained area that reached the proximal resection margin (white arrow). (c) Pathologic findings revealed squamous cell carcinoma and thin muscularis propria in the diverticulum. (d) The carcinoma invaded in the lamina propria mucosa. Black arrow indicates the muscularis mucosa.
diagnosed during surgery, as in our patient.\textsuperscript{8} Endoscopic optical biopsy technologies have recently been developing, and magnifying NBI provides high diagnostic accuracy of esophageal squamous cell carcinoma.\textsuperscript{11} Therefore, it might be possible for surgeons to perform appropriate surgical procedures for patients with Zenker’s diverticulum according to a differential diagnosis of malignancy based on preoperative magnifying NBI. We were not able to identify the malignant lesion preoperatively in the present case. We did not observe the diverticulum using iodine staining or NBI because the mucosa of the diverticulum was clean under white light endoscopy. Although the frequency of cancer in Zenker’s diverticulum is low, we should consider the presence of a malignant lesion in the diverticulum and observe the mucosa using preoperative NBI. Additionally, our patient had several risk factors for the development of carcinoma in the diverticulum, including a large diverticulum, long-standing history of symptoms, cigarette smoking, and alcohol consumption.

Owing to the low frequency of Zenker’s diverticulum, especially carcinoma within such a diverticulum, its clinical management and definitive treatment are still controversial. Diverticulectomy, diverticuloscopy, and criopharyngeal myotomy have been performed as surgical strategies for Zenker’s diverticulum. We performed diverticulectomy with criopharyngeal myotomy, which is a popular procedure in Japan. Endoscopic stapling diverticulectomy is becoming increasingly popular because of its low rate of complications and shorter postoperative stay.\textsuperscript{8,12} Endoscopic stapling diverticulectomy is a minimally invasive treatment, and its performance is advocated if a carcinoma in the diverticulum is definitively ruled out preoperatively.\textsuperscript{13} The treatment for a carcinoma in Zenker’s diverticulum should generally follow the same principles as the treatment for esophageal carcinoma.\textsuperscript{14,15} Although the standard treatment of mucosal esophageal cancer is endoscopic submucosal dissection, this procedure should not be applied to cancer in Zenker’s diverticulum because of the thin muscularis propria of the diverticulum, even if the deepest layer of the tumor is the lamina propria mucosa.\textsuperscript{16} The treatment of a carcinoma in Zenker’s diverticulum, like the treatment for esophageal carcinoma, must include a surgical procedure that completely resects all of the carcinoma. We resected the cervical esophagus, including the proximal stump of the diverticulum, and performed cervical lymphadenectomy in the present case. Resection of the cervical esophagus including the proximal stump of the diverticulum might have been adequate because the depth of tumor invasion in the resected specimen was the lamina propria mucosa; however, the depth of tumor invasion in the remnant lesion was unidentified. Therefore, we also performed cervical lymphadenectomy.

In summary, careful examination should be performed prior to any definitive surgical procedure for Zenker’s diverticulum, especially if the patient has exhibited sudden changes in the severity of symptoms or has risk factors for malignancy. The best surgical treatment for a carcinoma in Zenker’s diverticulum is still controversial. We believe that such treatment must follow the same principles as that for esophageal carcinoma with exact preoperative examinations, except that endoscopic submucosal dissection is not recommended.

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