INTRODUCTION

Early esophageal cancer (EEC) is defined as a tumor limited to the mucosa with or without lymph node or distant organ metastasis.1 When the tumor is limited to the mucosa of the esophagus, endoscopic resection (ER) is recommended as an alternative therapeutic modality because it is associated with a long-term survival outcome, similar to that achieved by surgery.2,3 Nevertheless, there are some limitations to the efficacy and safety of ER; this technique is associated with post-ER recurrence, especially when a lesion of >20 mm is removed by piecemeal resection.4 To overcome these limitations, endoscopic submucosal dissection (ESD) was introduced. ESD enables en bloc resection regardless of the size or presence of submucosal fibrosis.5

To date, there has been scant long-term follow-up data on ESD for EEC. Several studies have reported local recurrences after ESD for EEC, but few patients with complete resection during ESD have recurrent cancer.4,6 Incomplete resection can leave residual disease and thus some possibility of local recurrence. Here, we report a rare case of a submucosal tumor-like recurrence after endoscopic resection of early esophageal cancer.

CASE REPORT

A 68-year-old man presented with dysphagia of 1-month duration. Three years previously, he had been diagnosed with EEC of the lower esophagus judged to be T1aN0M0 (stage I) and had undergone ESD (Fig. 1A, B). Upon pathological examination, a 1.4×1.1 cm well-to-moderately differentiated squamous cell carcinoma (SCC) was found to have invaded the muscularis mucosa (MM) without penetration (Fig. 1C). The vertical resection margin was negative for carcinoma, but the distal resection margin was positive for SCC and this ESD was regarded as an incomplete resection. However, on follow-up endoscopy (at 4th day after ESD), the endoscopic findings suggesting remnant cancer was not seen and argon plasma coagulation (APC) was performed for the distal margin. Thereafter, we checked the existence of residual carcinoma by serial follow-up studies, including chest computed tomography (CT) scans and endoscopy with biopsy over the course of 18 months (Fig. 1D). We identified no recurrence on the esoph-
The patient was then lost to follow-up.

On the current visit, the patient reported that he was a current smoker with a 20 pack-year smoking history. Laboratory findings were unremarkable. On the endoscopic images, the post-ESD scar was observed at the lower esophagus, but it looked like an SMT (Fig. 2A). At its center, a tiny nodular change was seen, and this was unstained by lugol chromoendoscopy (Fig. 2B). On magnified endoscopy with narrow band imaging, an irregular microvascular pattern was observed in the nodular area (Fig. 2C). Endoscopic biopsy revealed recurrent SCC. On endoscopic ultrasonography (EUS), the cancer was found to have invaded the muscularis propria, but there was no LN enlargement (Fig. 2D). Chest CT scans showed a 1.5 cm low density mass at the lower esophagus, and positron emission tomography showed increased 18fluoro-2-deoxyglucose uptake in the same area. Ivor-Lewis esophagectomy with 2-field LN dissection was performed. On gross examination, the esophagus was found to have a relatively ill-defined white solid mass, 1.5×1.5 cm in size, located mainly on the submucosa and muscularis propria in cross section (Fig. 2E). On pathological examination, the SCC was found to have invaded the adventitia with a mixed infiltrative and expanding growth pattern (Fig. 2F). There was no evidence of LN metastasis. The patient subsequently underwent six cycles of adjuvant chemotherapy (5-fluorouracil plus cisplatin). He is currently alive, and there has been no recurrence throughout the 17-month follow-up period.

**DISCUSSION**

In 1966, Takubo et al. coined the term 'EEC,' but they did not provide a definition of it. In the first edition of the guidelines issued by the Japan Esophageal Society (JES), EEC was defined as mucosal or submucosal carcinoma of the esophagus regardless of LN metastasis. Recently, in the 10th edition of the guidelines issued by the JES, EEC was defined as a lesion...
limited to the MM, regardless of LN or distant organ metastasis (e.g., EEC: T1aNxMx). A lesion that has invaded the mucosal and submucosal layers is designated a superficial esophageal cancer, regardless of LN or distant organ metastasis. In the case reported here, a patient initially diagnosed with EEC had a carcinoma that invaded the MM after ESD.

To date, the indications for ESD have been based on the presence of LN metastasis. The factors associated with LN metastasis are invasion depth, venous invasion, lymphatic infiltration, and tumor grade and histology. According to the 2007 guidelines issued by the JES, absolute indications for ER are lesions limited to the mucosal epithelium (EP) or lamina propria mucosa (LPM) and not exceeding two-thirds of the circumference because these lesions have little possibility of LN metastasis. Lesions that have extended into the MM, those with minute submucosal invasion (SM1) not accompanied by clinical evidence of LN metastasis, or EP or LPM lesions exceeding two-thirds of the circumference are relative indications for ER because of the possibility of LN metastasis and postoperative complications. Fujishiro and Kodashima recommended that EP or LPM lesions exceeding 15 mm and MM or SM1 lesions not accompanied by clinical evidence of LN metastasis are good indications for ESD. In addition, lesions with submucosal fibrosis, such as residual or recurrent lesions occurring after ER or chemoradiotherapy, and with low possibility of LN metastasis are considered as extended indications for ESD. On the basis of these data, we performed ESD and additional APC for our patient and found no recurrence on endoscopy and chest CT examinations performed during an 18-month follow-up.

Several studies have reported that patients with complete resection during ESD have a very low risk of local recurrence, but there remains a possibility of local recurrence, particularly in the case of incomplete resection during ESD. Ono et al. reported one case of local recurrence among patients with incomplete resection and no local recurrence among patients with complete resection during a mean follow-up of 632 days of patients who underwent ESD for 107 superficial esophageal squamous cell neoplasms. Yoshinaga et al. reported that patients with completely resected superficial adenocarcinoma at the esophageal junction during ESD had no recurrence or metastasis during a median follow-up period of 30.1 months. However, in one patient with incomplete resection, lung metastases were found 3 years after the ESD. In another stu-
of 58 consecutive esophageal squamous cell neoplasms resected by ESD, one incompletely resected lesion recurred locally 6 months after the ESD and was treated successfully by a second ESD procedure. As indicated in these reports, more favorable outcome was produced with complete resection than with incomplete resection for EEC.

In our patient, EEC was initially removed with an incomplete ESD resection followed by APC; but after 3 years, we performed a second operation for a locally recurrent SMT-like carcinoma. To the best of our knowledge, this is the first case report of a recurrent SMT-like cancer occurring after ESD for EEC. The possible mechanism underlying how locally recurrent SMT-like cancer occurred after incomplete ESD was suggested as follows: after incomplete ESD, the remnant cancer might have been buried under the normal surrounding squamous EP during the healing process. This buried cancer might grow slowly within the deep layer of the esophageal wall without exposure to the surface. This course would lead to a SMT-like recurrence, which is difficult to diagnose. A few studies have reported buried Barrett’s EP associated with malignant transformation after ablation therapy for Barrett’s esophagus.14,15

There are few reports on the APC after incomplete ESD of EEC. However, APC has been used effectively in the Barrett’s dysplasia16,17 and early gastric cancer.18 Therefore, even though other treatment options such as surgery or concurrent chemoradiotherapy could be considered in the case of incomplete resection, we chose APC to the distal margin and close follow-up in this case.

In summary, we reported a very rare SMT-like recurrent carcinoma occurring after incomplete ESD for EEC. This suggests that local recurrence could occur as uncommon forms, such as SMT, after ER for EEC.

Conflicts of Interest

The authors have no financial conflicts of interest.

REFERENCES

1. Japan Esophageal Society. Japanese Classification of Esophageal Cancer, tenth edition: part I. Esophagus 2009;6:1-25.
2. Repici A, Hassan C, Carlino A, et al. Endoscopic submucosal dissection in patients with early esophageal squamous cell carcinoma: results from a prospective Western series. Gastrointest Endosc 2010;71:715-721.
3. Watanabe M, Suehara N, Koga K, et al. Outcomes of endoscopic submucosal dissection and esophagectomy for early and superficial carcinoma of the esophagus. Esophagus 2010;7:215-217.
4. Ishihara R, Ishi H, Takeuchi Y, et al. Local recurrence of large squamous-cell carcinoma of the esophagus after endoscopic resection. Gastrointest Endosc 2008;67:799-804.
5. Oro S, Fujishiro M, Nüni K, et al. Long-term outcomes of endoscopic submucosal dissection for superficial esophageal squamous cell neoplasms. Gastrointest Endosc 2009;70:860-866.
6. Yoshinaga S, Gotoda T, Kusano C, Oda I, Nakamura K, Takayanagi R. Clinical impact of endoscopic submucosal dissection for superficial adenocarcinoma located at the esophagogastric junction. Gastrointest Endosc 2008;67:202-209.
7. Fujishiro M, Yahagi N, Kakushima N, et al. Endoscopic submucosal dissection of esophageal squamous cell neoplasms. Clin Gastroenterol Hepatol 2006;4:688-694.
8. Hirasawa K, Kokawa A, Oka H, et al. Superficial adenocarcinoma of the esophagogastric junction: long-term results of endoscopic submucosal dissection. Gastrointest Endosc 2010;72:960-966.
9. Kakushima N, Yahagi N, Fujishiro M, Kodashima S, Nakamura M, Omata M. Efficacy and safety of endoscopic submucosal dissection for tumors of the esophagogastric junction. Endoscopy 2006;38:170-174.
10. Takubo K, Aida I, Sawabe M, et al. Early squamous cell carcinoma of the oesophagus: the Japanese viewpoint. Histopathology 2007;51:733-742.
11. Kuwano H, Nishimura Y, Ohtsu A, et al. Guidelines for diagnosis and treatment of carcinoma of the oesophagus April 2007 edition: part I edited by the Japan Esophageal Society. Esophagus 2008;5:61-73.
12. Eguchi T, Nakashima Y, Shioda T, et al. Histopathological criteria for additional treatment after endoscopic mucosal resection for esophageal cancer: analysis of 464 surgically resected cases. Mod Pathol 2006;19:475-480.
13. Fujishiro M, Kodashima S. Indications, techniques, and outcomes of endoscopic submucosal dissection for esophageal squamous cell carcinoma. Esophagus 2009;6:143-148.
14. Mino-Kenudson M, Ban S, Ohana M, et al. Buried dysplasia and early adenocarcinoma arising in Barrett esophagus after porfimer-photodynamic therapy. Am J Surg Pathol 2007;31:403-409.
15. Badreddine RJ, Prasad GA, Wang KK, et al. Prevalence and predictors of recurrent neoplasia after ablation of Barrett’s esophagus. Gastrointest Endosc 2010;71:697-703.
16. Dumot JA, Greenwald BD. Argon plasma coagulation, bipolar cauterity, and cryotherapy: ABC’s of ablative techniques. Endoscopy 2008;40:1026-1032.
17. Attwood SE, Lewis C, Caplin S, Hemminger K, Armstrong G. Argon beam plasma coagulation as therapy for high-grade dysplasia in Barrett’s esophagus. Clin Gastroenterol Hepatol 2003;1:258-263.
18. Tomita T, Arai E, Kohno T, et al. Outcomes of treatment of argon plasma coagulation therapy in elderly or high-risk patients with early gastric cancer: a comparison of outcomes among experienced and nonexperienced endoscopists. J Clin Gastroenterol 2011;45:e54-e59.