# Endoscopic Evaluation and Management of Superficial Esophageal Squamous Cell Carcinoma

Priscilla Lopez[1,2] Mohan Ramchandani[3] Sundeep Lakhtakia[3] Anuradha Sekaran[3] Pradev Inavolu[3] Nageshwar Reddy[3]

[1] Department of Surgery Clinica Las Condes, Santiago, Chile
[2] Department of Therapeutic endoscopy Instituto Chileno- Japonés de enfermedades digestivas, Santiago, Chile
[3] Department of Gastroenterology, Asian Institute of Gastroenterology, Hyderabad, Telangana, India

**Address for correspondence** Nageshwar Reddy MD, DM, FRCP, Department of Medical Gastroenterology, Asian Institute of Gastroenterology, 500032 Hyderabad, Telangana, India (e-mail: aigindia@yahoo.co.in).

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## Abstract

Esophageal squamous cell carcinoma (SCC) is the seventh most common malignancy and the sixth leading cause of cancer-related deaths globally, demanding precise diagnostic and individualized therapeutic interventions. This case study describes the diagnosis and treatment of esophageal SCC in a 54-year-old man initially detected during an upper gastrointestinal endoscopy. The lesion was identified using narrow-band imaging and magnifying endoscopy; after imaging studies, it was treated with endoscopic submucosal dissection (ESD). ESD is known for its minimal invasiveness and the definitive histopathological evaluation it facilitates.

The management strategy described in this paper reiterates the criticality of extensive pretreatment evaluations, the indication of the application of ESD, and the importance of a multidisciplinary team. It underscores the significance of careful posttreatment monitoring and the informed selection of adjuvant therapies, particularly in areas like India, where such advanced endoscopic techniques are still on the rise.

**Keywords**

- early esophageal cancer
- endoscopic submucosal dissection
- esophageal cancer
- esophageal squamous cell carcinoma
- intrapapillary capillary loop

## Introduction

Esophageal carcinoma ranks as the ninth most common malignancy and the sixth leading cause of cancer-related deaths globally.[1] Early detection of superficial esophageal squamous cell carcinoma (SCC) can significantly improve prognosis, with endoscopic treatment being the therapeutic mainstay. Endoscopic submucosal dissection (ESD) has emerged as a preferred modality, owing to its minimally invasive and its ability to provide accurate histopathological assessment of resection margins.[2,3] This is particularly pertinent in regions like India, where the implementation of ESD is developing, and the evaluation of ESD specimens is crucial for distinguishing curative from noncurative resections. This paper presents a case of early esophageal SCC managed endoscopically and discusses the post-ESD histopathological evaluation.

## Case Report

This is a case report of a 54-year-old man with antecedents of chronic pancreatitis, myotonic dystrophy type 2, and cardiac illness. During an esophagogastroduodenoscopy for dyspepsia, reddish mucosa with the disappearance of the background vascular network was observed in the midesophagus, occupying over three-quarters of the esophageal circumference. The lesion predominantly exhibited flat or slightly irregular surfaces, with a small nodular zone of about 5 mm, rising around 1 mm above the surrounding tissue.

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Utilizing narrow-band imaging, we noted notable well-demarcated brownish area with irregular micro vessel patterns (due to irregular expansion of microvascular pattern of intrapapillary capillary loops) and altered background coloration. Magnification endoscopy provided a closer inspection of the vascular architecture, revealing predominantly Type B1 vessels as classified by the Japanese Esophageal Society (JES).[4] These dilated, tortuous vessels with nonuniform caliber and shape are indicative of superficial esophageal SCC, mainly when confined to the epithelium (EP) or the lamina propria (LPM). Additionally, areas exhibiting Type B2 characteristics were identified, characterized by abnormal vessels lacking a loop-like formation, with stretched and markedly elongated microvessels and a small segment in the nodular part with a marked dilation and irregularity vessels, but less than Type B3. Due to the nodular zone with vessel dilatation, it was decided to perform an endoscopic ultrasound (EUS), which showed a superficial lesion with no involvement of the muscularis propria, with round but small lymph nodes (7 mm × 7 mm). Positron emission tomography–computed tomography showed esophageal wall thickening in the middle and lower esophagus, without esophageal mass or lymphadenopathy. ESD was decided.

During the ESD procedure, peripheral marking of the esophageal lesion was carried out using a force coagulation current. After a submucosal cushion had been created, a transverse incision of mucosa in the distal part of the lesion and on the oral side was performed. A submucosal tunnel was then created by ESD using standard saline solution and Indigo Carmine. The ESD was done using the tunnel technique. One longitudinal bridge of mucosa was conserved to reduce the risk of esophageal stricture. The lesion was excised in one piece (►**Fig. 1**, ►**Video 1**). The lesion was removed using a large foreign body net. The histopathological examination confirmed the presence of a well to moderately differentiated SCC. The tumor had penetrated the submucosal layer (T1bSM2: 350 µm) but did not exhibit lymphatic, capillary, vein, or artery space invasion, and all resection margins were clear of the tumor (R0) (►**Figs. 2**, **3**, **4**).

**Video 1**

This video illustrates a comprehensive endoscopic evaluation of esophageal squamous cell carcinoma utilizing white light, narrow-band imaging, and magnification techniques for detailed visualization. It also demonstrates the procedural steps of endoscopic submucosal dissection. Online content including video sequences viewable at: https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0044-1788707.

The patient demonstrated a favorable recovery postoperatively, with no complications following the procedure.

We discussed a multidisciplinary team, and it was decided to give chemoradiotherapy.

## Discussion

In the presented case, we detail the profile of a patient diagnosed with SCC of the esophagus who underwent a thorough evaluation prior to treatment. In the diagnostic workup for cancer invasion, the depth of superficial

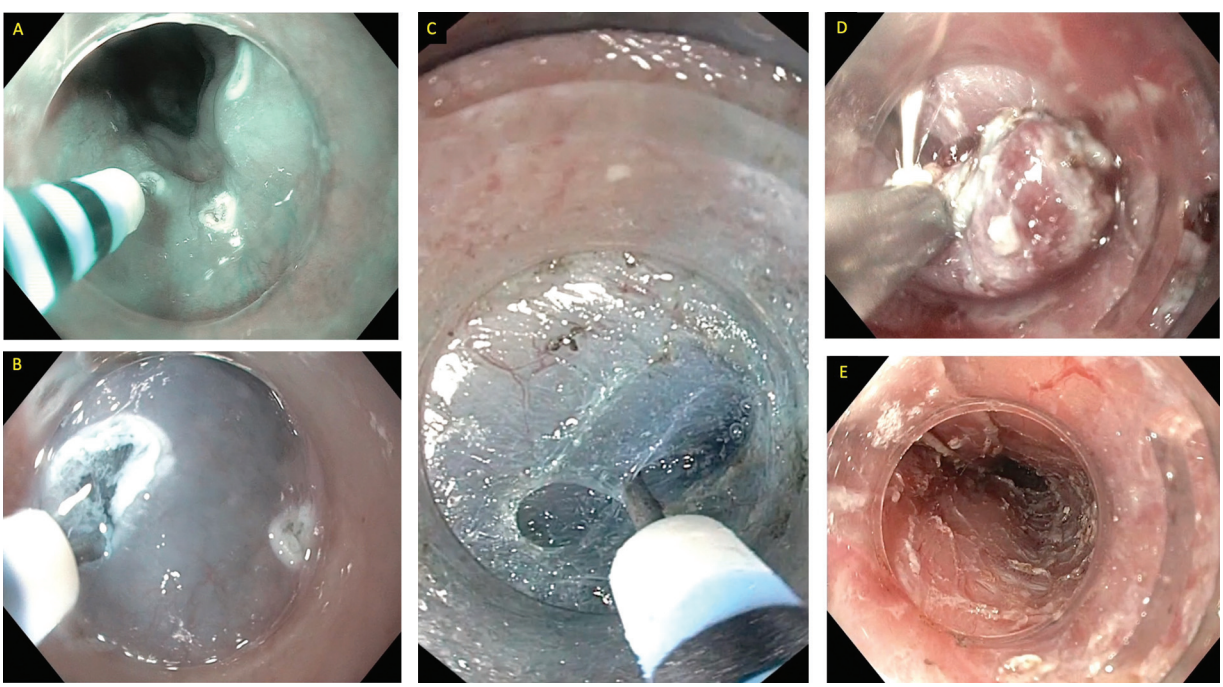


**Fig. 1** Endoscopic submucosal dissection: (**A**) Marking dots were made by a dual knife 5 mm away from the border of the lesion. (**B**) Mucosal incision of the proximal side. (**C**) Submucosa dissection. (**D**) An endoclip (Olympus HX-610-090, Tokyo, Japan) with a line was attached to the back side of the specimen. (**E**) The line was pulled through the mouth to give traction. En bloc resection was done.

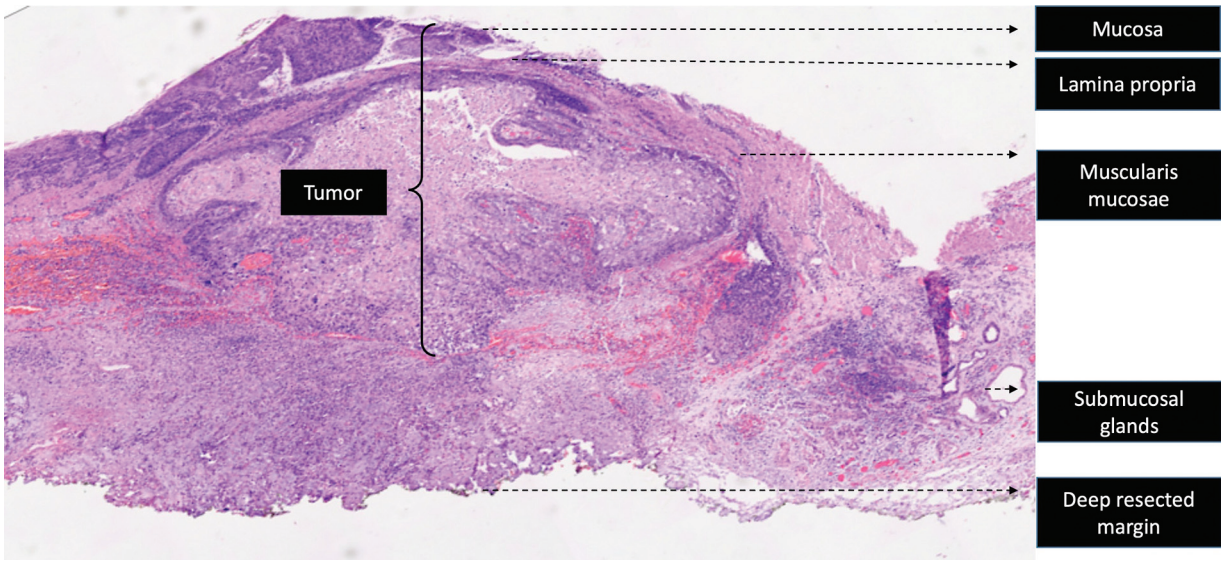


**Fig. 2** Tumor cells are extended into the submucosa with an unevolved deep margin.

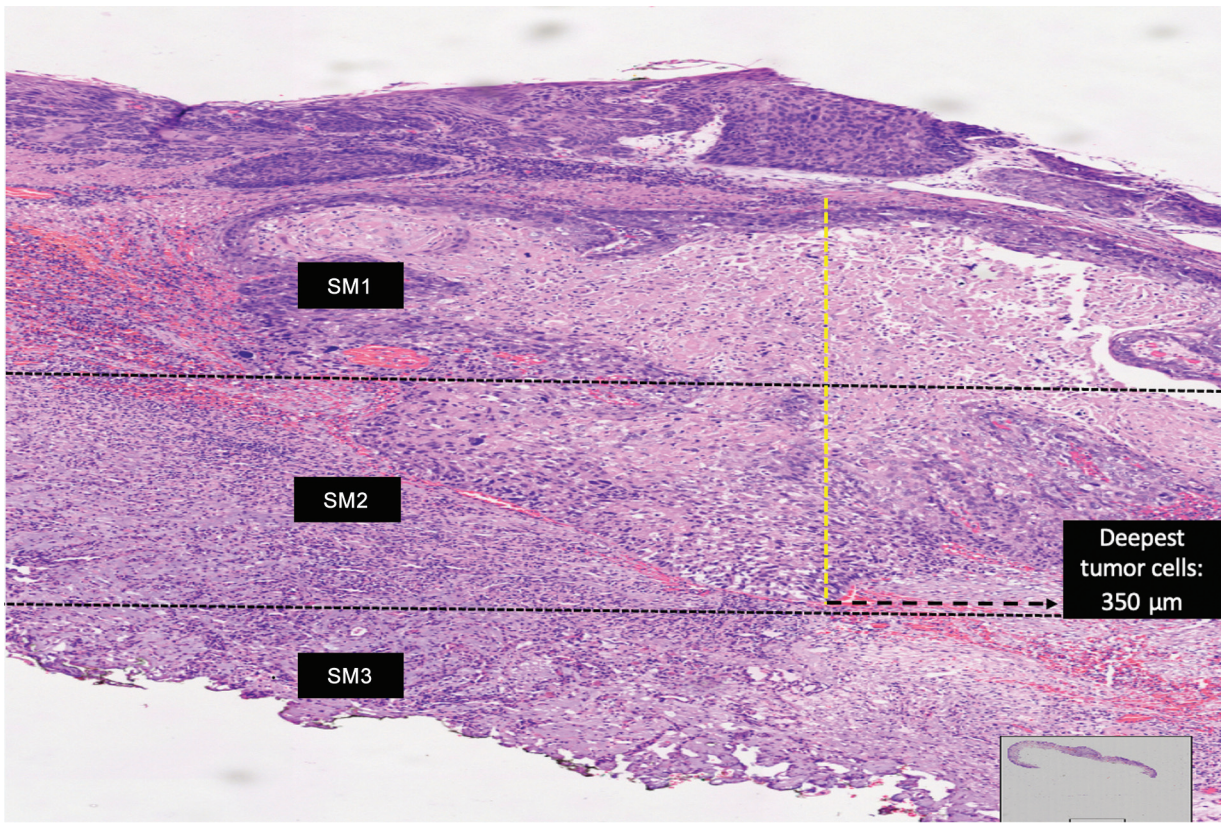


**Fig. 3** The ESD specimen, showing an invasive squamous cell carcinoma into the submucosa. The submucosa can be arbitrarily divided into thirds of equal size, labeled SM1 (≤ 200 µm into the submucosa), SM2 (>200 µm into the submucosa), SM3, and the depth of invasion is designated into the corresponding SM level. Alternatively, the depth of invasion is measured (in mm or µ) from the deepest layer of the muscularis mucosa to the deepest point in the submucosa. Clearance to the deep margin (in mm or µ) should be measured from the deepest point of invasion in the submucosa to the margin. ESD, endoscopic submucosal dissection; SM, submucosal.

esophageal cancer can be categorized into several levels: EP and LPM, muscularis mucosa (MM), and submucosal invasion at two depths—SM1 (≤200 µm into the submucosa) and SM2 (>200 µm into the submucosa), SM3 (►**Fig. 2**). Cancers identified as EP/LPM or MM/SM1 are typically managed with endoscopic resection (ER), whereas those at the SM2 level or beyond usually necessitate surgical resection or chemoradiation therapy.[2,5] Accurate differentiation between these depths—specifically distinguishing SM1 from SM2—is critical for selecting the most suitable treatment approach.

The initial assessment of cancer invasion depth is carried out using nonmagnifying white-light endoscopy, which

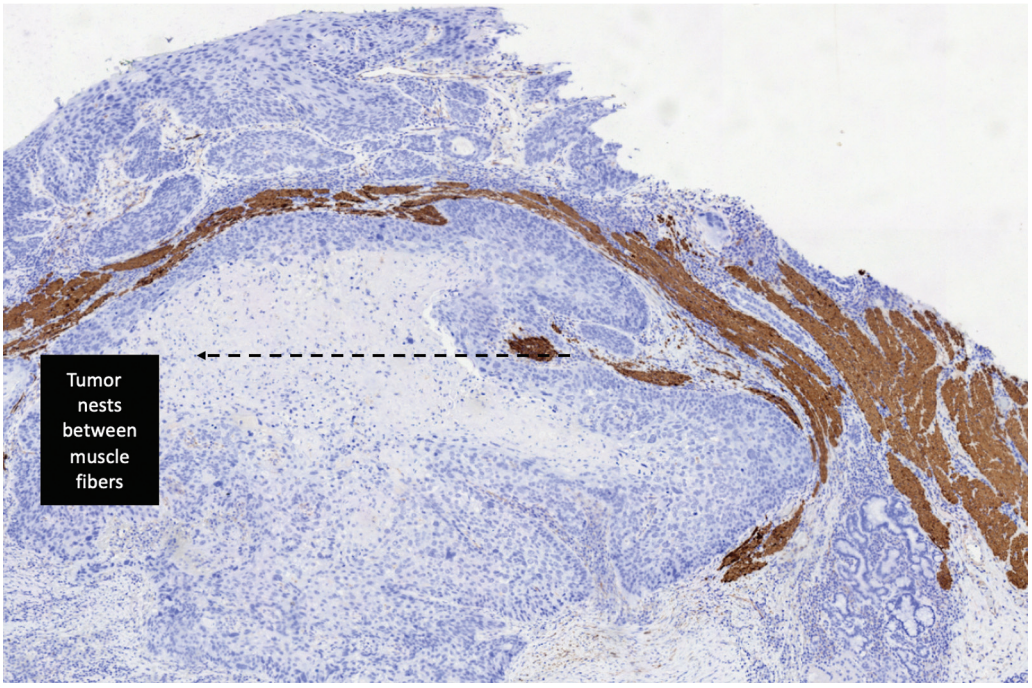


**Fig. 4** Tumor nests between muscle fibers highlighted by immunohistochemistry with Desmin.

examines features such as surface irregularity and lesion thickness. Lesions that are flat or display minimal unevenness (≤1 mm) are generally classified as SM1 or less. In contrast, those with an elevation or thickness greater than 1 mm and excavated lesions (0–IIc/III) indicate deeper submucosal invasion. Magnifying endoscopy considers the JES classification system to assess the invasion depth further.[4] The lesion composition is crucial in this diagnosis (►**Table 1**): a lesion made up of Type B1 vessels or a small avascular area (AVA) indicates EP/LPM cancer; the presence of Type B2 vessels or a medium-sized AVA suggests MM or SM1 cancer; and Type B3 vessels (►**Fig. 5**) or a large AVA denotes SM2 cancer.[6] Notably, even among lesions preoperatively classified as MM/SM1, a significant percentage (27.4–55.2%) may be EP/LPM, where ER could be curative. Conversely, 15.5 to 27.9% might include SM2 cancers.[5] This disparity

**Table 1** Diagnostic values of Type B vessels (microvascular patterns) for estimating invasion depth of superficial squamous cell carcinomas

| | Paper | S (95% CI) | E (95% CI) | PPV (95% CI) | NVP (95% CI) | Accuracy (95% CI) |
|---|---|---|---|---|---|---|
| B1 (T1a-EP or T1a-LPM | Kim et al 2017[9] | 71.4 (51.1–86) | 100 (89.6–100) | 100 (80–100) | 84.0 (70.3–92.4) | 88.6 (78.2–94.6) |
| | Oyama et al 2017[4] | 97.5 (93.8–99.3) | 72.9 (58.2–84.7) | 92.4 (87.4–95.9) | 96.2 (92.3–98.4) | 91.9 (87.4–95.2) |
| | Tanaka et al 2020[10] | 77.0% | 84.1% | 95.7% | 44.0% | – |
| | Ueda et al 2021[11] | 96.9% | 73.3% | 94.0% | 84.6% | 92.5% |
| B2 (T1a-MM or T1b-Sm1) | Kim et al 2017[9] | 94.4 (70.6–99.7) | 73.1 (58.7–84) | 54.8 (36.3–72.2) | 97.4 (71.9–99.7) | 78.6 (66.8–87.1) |
| | Oyama et al 2017[4] | 75.0 (55.1–89.3) | 96.2 (92.3–98.4) | 75.0 (55.1–89.3) | 96.2 (92.3–98.4) | 93.4 (89.1–96.3) |
| | Tanaka et al 2020[10] | 76.5% | 75.7% | 33.3% | 95.3% | – |
| | Ueda et al 2021[11] | 50.0% | 96.5% | 64.3% | 93.8% | 91.3% |
| B3 (T1b-SM2) | Kim et al 2017[9] | 75.0 (52.9–89.4) | 97.8 (87–99.9) | 94.7 (71.9–99.7) | 88.2 (75.4–95.1) | 90 (79.9–95.5) |
| | Oyama et al 2017[4] | 55.0 (31.5–76.9) | 100 (98.1–100) | 100 (75.1–100) | 95.5 (91.6–97.9) | 95.9 (92.1–98.0) |
| | Tanaka et al 2020[10] | 40.0% | 99.2% | 66.7% | 97.5% | – |
| | Ueda et al 2021[11] | 83.3% | 98.6% | 83.3% | 98.6% | 97.5% |

Abbreviation: CI, confidence interval; S, sensitivity; E, especificity; PPV, positive predictive value; NVP, negative predictive value.

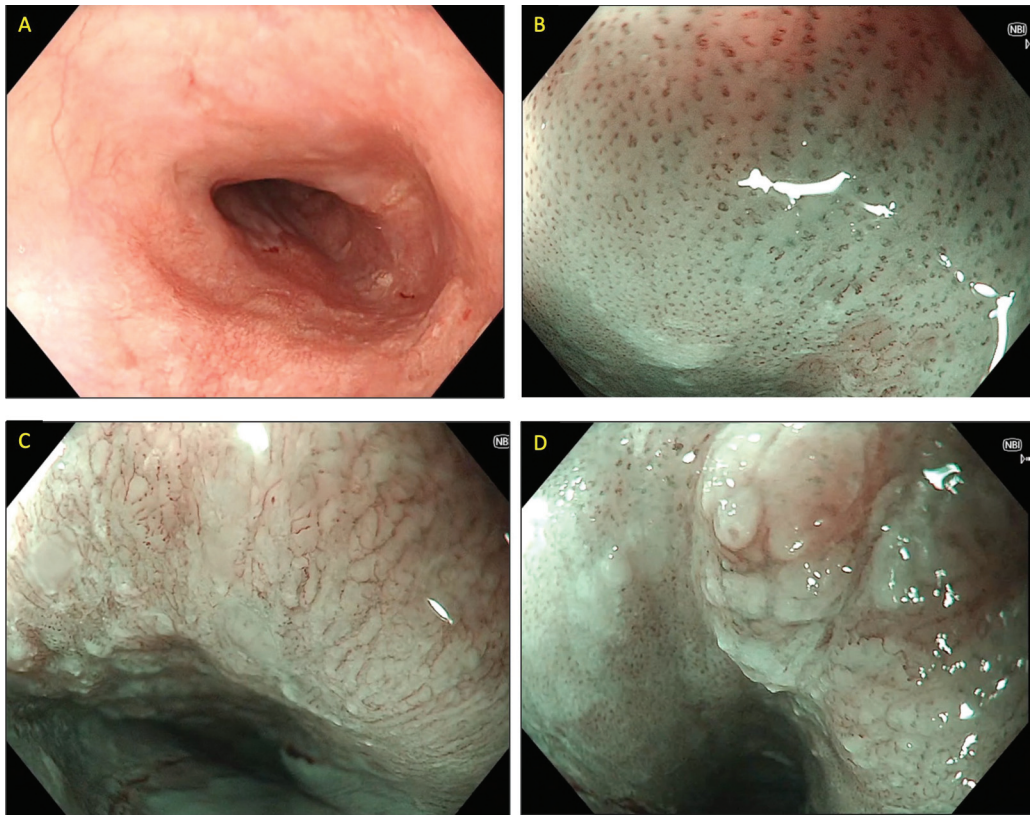


**Fig. 5** Diagnostic endoscopy with white light and magnifying endoscopy combined with NBI. (**A**) Diagnostic endoscopy with white light: white light endoscopy demonstrates a suspicious flat lesion in the mid esophagus around 75% of circumference. (**B**) Type B1 vessels with a loop-like formation. (**C**) Type B2 vessels without a loop-like formation. (**D**) Suspected area between B2 and B3 vessels.

underscores the relatively low precision of preoperative diagnosis in such cases, leading to the recommendation that the least invasive treatment—typically ER—be the initial therapeutic strategy.

The decision to proceed with esophageal ESD also hinges on whether the lesion is circumferential. Esophageal ESD is indicated for noncircumferential and circumferential lesions, provided they are classified as cT1a EP/LPM N0M0 and measure $\leq$ 50 mm.[7] In the case we are discussing, the lesion was more than three-quarters circumferential; such extensive involvement heightens the risk of post-ER stricture, which has been reported to occur in 60%; and escalates to 100% following complete circumferential resection without prophylactic measures.[5] Effective preventive strategies can substantially reduce stricture rates to 11.3 to 36.2%.[7] Triamcinolone prophylaxis was employed, successfully preventing stricture formation during follow-up.

The role of EUS is limited in identifying submucosal invasion for early-stage esophageal cancers. While EUS tends to understage 15 to 25% of cases compared with staging post-endoscopic mucosal resection (EMR), about 4 to 12% of cases might be overstaged. The current evidence does not support the routine use of EUS before EMR or ESD for high-grade dysplasia or superficial esophageal cancer due to these limitations. However, EUS is advisable for the staging of lesions at high risk of invasive cancer due to the significant probability of invasion. While a negative EUS does not contribute substantially to the management, a positive EUS result can substantially alter the treatment approach.[3]

In the current case, histopathological findings revealed tumor penetration into the submucosal layer to a depth of 350 µm, classified as T1bSM2, with no evidence of lymphatic, capillary, venous, or arterial invasion. The extent of infiltration up to SM2 suggests an approximately 21% risk of lymph node metastasis, in stark contrast to the 3 to 6% risk associated with SM1-level invasion.[5] Given this increased risk profile, the patient was considered a candidate for adjuvant therapy, and the clinical team recommended either chemoradiotherapy or surgical intervention as a follow-up to the initial endoscopic management.[8]

## Conclusion

In this case, the critical role of comprehensive pretreatment evaluation is in managing esophageal SCC. It demonstrates that vigilance is essential, while most early-stage lesions can be effectively treated with organ-preserving, minimally invasive ESD. Despite thorough imaging and endoscopic assessments, the depth of invasion may be greater than initially anticipated. Hence, a multidisciplinary approach is the most important to guide post-ESD management, balancing the benefits of less invasive treatments against the need for additional interventions such as chemoradiotherapy or surgery. Our findings highlight the decision-making required in such cases, ensuring the implementation of a

personalized therapeutic strategy that optimizes outcomes for patients with esophageal SCC.

Conflict of Interest
None declared.

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