Factors associated with the outcomes of endoscopic submucosal dissection in pyloric neoplasms

Jung Ho Bae, MD,[1] Gwang Ha Kim, MD,[1] Bong Eun Lee, MD,[1] Tae Kyun Kim, MD,[1] Do Youn Park, MD,[2] Dong Hoon Baek, MD,[1] Geun Am Song, MD[1]

Busan, Korea

Background: Pyloric neoplasms are one of the most technically difficult lesions to remove by endoscopic submucosal dissection (ESD).

Objective: To evaluate the therapeutic outcomes of ESD in pyloric neoplasms according to clinicopathologic characteristics and to assess predictive factors for incomplete resection.

Design: A retrospective, single-center study.

Patients: A total of 110 cases of pyloric adenomas and early cancers treated with ESD from January 2007 to May 2013 were included.

Intervention: ESD procedures with or without retroflexion maneuver were used in all qualifying cases.

Main Outcome Measurements: Therapeutic outcomes of ESD and procedure-related adverse events.

Results: Complete resection rates differed significantly in relation to location (pylorus vs pylorus with duodenal extension, 79% vs 58%), directional distribution (upper hemisphere vs lower hemisphere of the pylorus, 67% vs 90%), tumor size ($\leq$ 10 mm vs $>$ 10 mm, 84% vs 67%), and circumferential extent of pyloric mucosal resection ($\leq$ 1/2 vs $>$ 1/2, 92% vs 62%). On multivariate analysis, tumor location (pylorus with duodenal extension; odds ratio 5.747), hemispheric distribution (upper hemisphere; odds ratio 4.906), and circumferential extent of resection ($>$ 1/2; odds ratio 3.960) were independent factors associated with incomplete resection. The rates of procedure-related bleeding, stenosis, and perforation were 8%, 1%, and 1%, respectively; none of the adverse events required surgical intervention.

Limitations: Single-center, retrospective study.

Conclusions: ESD is a safe, effective, and feasible treatment for pyloric neoplasms. However, the complete resection rate decreases for tumors that have duodenal extension, are located in the upper hemisphere, and have large circumferential extent of resection. (Gastrointest Endosc 2015;81:303-11.)

Endoscopic submucosal dissection (ESD) is a widely accepted treatment for premalignant lesions and early cancers in the stomach. The use of ESD has increased the rate of successful en bloc resection and has made en bloc resection possible for tumors even in difficult locations, such as the esophagogastric junction and pylorus.[1-4] ESD for tumors in difficult locations, however, is still a technical challenge, with a low rate of successful resection, a long procedure time, and a high rate of adverse events compared with tumors in more favorable locations.[5-7]

The pylorus is a cone-shaped constricted region that demarcates the end of the stomach and the beginning

Abbreviations: ESD, endoscopic submucosal dissection; P-type, pylorus only type; PD-type, pylorus-duodenal type.

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Current affiliations: Departments of Internal Medicine (1) and Pathology (2), Pusan National University School of Medicine, Busan, Korea.

Reprint requests: Gwang Ha Kim, MD, Department of Internal Medicine, Pusan National University School of Medicine and Biomedical Research Institute, Pusan National University Hospital, 179, Gudeok-ro, Seo-Gu, Busan 602-739, Korea.

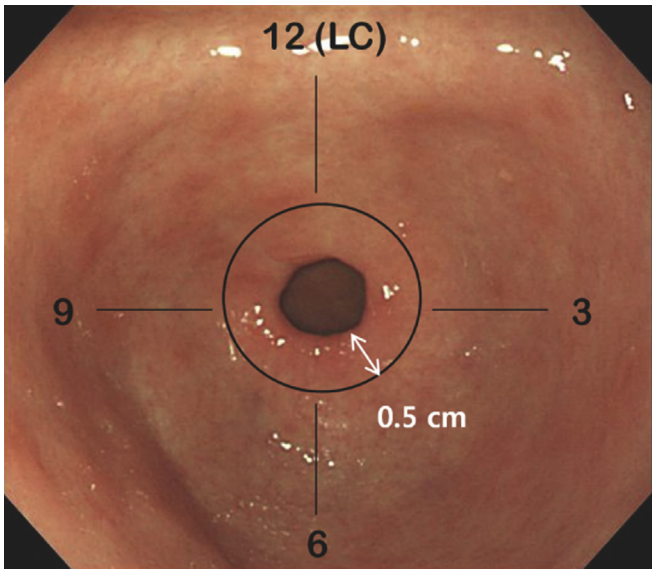

Figure 1. Endoscopic assessment of pyloric neoplasms. Pyloric neoplasms are defined as tumors with the distal margin located < .5 cm from the pyloric ring when the ring is fully opened. A clock-face orientation with the endoscope (with the lesser curve [*LC*] of the stomach in contiguity with the 12 o'clock of the pylorus) is used to classify directional distribution into 4 quadrants.

of the duodenum. This shape normally helps to prevent duodenogastric reflux and to control the passage of undigested food material into the intestine.[8] However, when a neoplasm is located at the pylorus, certain anatomic features of the pylorus adversely affect precise assessment of tumor margin and performance of ESD.[4] The distal portions of the lesions located in the pyloric channel can be hard to see with the forward-viewing endoscope, and their incision and dissection during ESD can be difficult because of the sharp angle. In addition, peristaltic contractions of peripyloric muscles make it difficult to dissect the lesion precisely. Furthermore, ESD of pyloric lesions extending to the duodenal bulb may require endoscope retroflexion in the duodenum, which requires advanced skills and experience. Therefore, pyloric neoplasms are one of the most difficult lesions to resect with ESD.

There have been few reports on the exact prevalence of pyloric neoplasms because of the rarity of the tumors and lack of a standard definition. A study on ESD for early gastric cancer reported that approximately 5% of these cancers were located at the prepyloric area,[9] and pyloric neoplasms account for 4.3% of all gastric adenomas and early gastric cancers in our hospital (unpublished data). The number of ESD procedures for treatment of pyloric neoplasms has been increasing with the improvement of ESD technique and devices, but reported studies are few. There are a few case studies on the result of ESD in pyloric neoplasms using the retroflexion technique or transnasal endoscope,[2,4,10,11] but there are no studies on clinical outcomes according to clinicopathologic characteristics of the tumors. Therefore, we aimed to evaluate the therapeutic outcomes of ESD in pyloric neoplasms and to assess factors that could be responsible for incomplete resection.

METHODS

Patients

From January 2006 to May 2013, 2514 patients with early gastric neoplasms (adenomas and early gastric cancers) were treated with ESD at Pusan National University Hospital. Of those, the records of 110 patients with 110 pyloric neoplasms were reviewed in this study. The inclusion criteria were (1) a neoplasm of the pylorus and (2) a biopsy specimen before the procedure showing adenoma (low- and high-grade dysplasia) and adenocarcinoma. All patients with early gastric cancer underwent abdominal CT scans to determine the presence of lymph node and distant metastases before ESD. Furthermore, EUS was performed to rule out the submucosal invasion in most cases. The study's protocol was reviewed and approved by the Institutional Review Board of the Pusan National University Hospital.

Assessment of tumor location and direction

The location of tumors was classified according to their duodenal extension: pylorus only type (P-type), which were confined to the antral side of the pylorus, with a distal margin < .5 cm from the pyloric ring when the ring was fully opened, and pylorus-duodenal type (PD-type), which extended beyond the pyloric channel. A clock-face orientation of the endoscope (with the lesser curve of the stomach in contiguity with the 12 o'clock of the pylorus) was used to characterize directional distribution according to quadrant: first quadrant (from 12 to 3 o'clock), second quadrant (from 3 to 6 o'clock), third quadrant (from 6 to 9 o'clock), and fourth quadrant (from 9 to 12 o'clock) (Fig. 1). The lesions were classified also according to upper and lower hemispheric distribution: upper hemisphere, from 9 to 3 o'clock; lower hemisphere, from 3 to 9 o'clock. When a lesion spanned 2 or more quadrants, the central portion of the lesion was used to designate its predominant direction. All endoscopic images of pyloric lesions were taken with the endoscope in the neutral position, where the lesser curvature of the stomach was aligned at 12 o'clock.

ESD procedures

ESD procedures were performed by 2 experienced endoscopists (G.H.K., G.A.S.), using a single-channel endoscope (GIF-H260 or GIF-Q260; Olympus Co, Ltd, Tokyo, Japan). ESD patients were operated on while under conscious sedation, with cardiorespiratory