

<https://www.helicobacterjournal.org>

Received March 12, 2025

Revised April 2, 2025

Accepted April 7, 2025

Corresponding authors

Jong Yeul Lee, MD

Center for Gastric Cancer,
National Cancer Center, 323 Ilsan-ro,
Ilsandong-gu, Goyang 10408, Korea
E-mail: jylee@ncc.re.kr

Hyo-Joon Yang, MD, PhD
Division of Gastroenterology,
Department of Internal Medicine and
Gastrointestinal Cancer Center,
Kangbuk Samsung Hospital,
Sungkyunkwan University
School of Medicine, 29 Saemunan-ro,
Jongno-gu, Seoul 03181, Korea
E-mail: hyojoonyang@gmail.com

Availability of Data and Material

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

Conflicts of Interest

Jin Lee and Young-Il Kim, contributing editors of the *Korean Journal of Helicobacter and Upper Gastrointestinal Research*, were not involved in the editorial evaluation or decision to publish this article. All remaining authors have declared no conflicts of interest.

Funding Statement

This work was supported by the Korean College of *Helicobacter* and Upper Gastrointestinal Research Foundation Grant (Grant Number, KCHUGR-202302004).

Acknowledgements

None

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<https://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

A Survey on the Management and Surveillance of Low-Grade Gastric Adenoma Among Gastroenterologists in South Korea

Jin Lee¹, Jae Yong Park², Joon Sung Kim³, Young-Il Kim⁴, Hyuk Lee⁵, Su Youn Nam⁶, Ki Taek Nam⁷, Hyo-Joon Yang⁸, Jong Yeul Lee⁴; and the Research Management Committee, Korean College of *Helicobacter* and Upper Gastrointestinal Research

¹Department of Internal Medicine, Inje University Haeundae Paik Hospital, Inje University College of Medicine, Busan, Korea

²Division of Gastroenterology, Department of Internal Medicine, Chung-Ang University College of Medicine, Seoul, Korea

³Division of Gastroenterology, Department of Internal Medicine, Incheon St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Seoul, Korea

⁴Center for Gastric Cancer, National Cancer Center, Goyang, Korea

⁵Department of Medicine, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea

⁶Department of Internal Medicine, School of Medicine, Kyungpook National University, Daegu, Korea

⁷Department of Biomedical Sciences, Yonsei University College of Medicine, Seoul, Korea

⁸Division of Gastroenterology, Department of Internal Medicine and Gastrointestinal Cancer Center, Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, Seoul, Korea

Objectives: Low-grade gastric adenomas (LGA) are managed using a variety of methods, unlike high-grade adenomas or early gastric cancers, which follow more standardized treatment protocols. This study aimed to assess the current practices and follow-up strategies used by South Korean gastroenterologists in managing LGA. **Methods:** An online survey was created with Google Forms and distributed to South Korean gastroenterologists via email or paper instructions containing a Quick Response code. **Results:** A total of 130 South Korean gastroenterologists responded to the survey. The size criteria for endoscopic treatment of LGAs were as follows: size-independent (68.5%), ≥ 5 mm (13.1%), ≥ 1 cm (16.2%), ≥ 1.5 cm (0.8%), and ≥ 2 cm (1.5%). Treatment decisions, such as performing endoscopic submucosal dissection, were primarily influenced by lesion size (88.5%), endoscopic appearance (62.3%), and location (41.5%). For lesions ≥ 1.5 cm, 85.3% ($n=111$) of respondents favored endoscopic submucosal dissection, whereas for lesions ≤ 1 cm, endoscopic mucosal resection or argon plasma coagulation was preferred. Regarding follow-up endoscopy intervals, most respondents (70.0%) conducted follow-up within 6 months post-endoscopic resection, with subsequent endoscopies at 1-year intervals. **Conclusions:** This study provides a detailed overview of the current management strategies for LGAs among South Korean gastroenterologists, highlighting the variability in approaches. Further research is required to develop more standardized guidelines for the management and surveillance of LGA.

Keywords Surveys and questionnaires; Adenoma; Endoscopic mucosal resection; Surveillance.

INTRODUCTION

The incidence of gastric cancer is rising globally, with notably high rates in East Asian countries, including South Korea.¹ In South Korea, the widespread use of upper gastrointestinal endoscopy for health screening has led to increased early detection of gastric cancer and adenomas. Consequently, the number of endoscopic resections is also rising.² A recent nationwide, population-based study in South Korea reported that approximately 100000 endoscopic submucosal dissections (ESDs) were performed for gastric cancer or adenoma between 2011 and 2017.³ Gastric adenoma, a precursor to gastric cancer, is classified into low-grade adenoma (LGA) and high-grade adenoma (HGA). The risk of malignancy in gastric adenomas varies according to the histological grade. In cases of HGA, the progression to gastric cancer occurs in approximately $\geq 50\%$ of patients, though results vary among studies. The malignancy risk for LGA is considered relatively low, approximately $<10\%$.⁴ Given the high malignancy risk, endoscopic resection, particularly ESD, is recommended for HGA; however, the treatment approach for LGA remains controversial due to its lower malignancy risk.

International guidelines and Korean publications have suggested various management methods for gastric adenomas.⁵⁻⁹ However, in South Korea, specific guidelines are still lacking. Generally, international guidelines recommend endoscopic resection as the primary treatment for gastric adenomas, regardless of histological grade, with common methods including endoscopic mucosal resection (EMR) and ESD. For LGA, resection is advised despite the low risk of malignant transformation. Yet, previous guidelines also support follow-up observation, leaving the necessity of treatment open to debate.^{6,10} Treatment approaches for LGA also depend on lesion size, but clear standards are absent. According to the British Society of Gastroenterology (BSG) guidelines, EMR is recommended for lesions <1 cm, while ESD is preferred for lesions >1 cm.⁷ The recent European Society of Gastrointestinal Endoscopy (ESGE) guidelines recommend ESD as the primary treatment for lesions of any size, with EMR as an alternative option for elevated lesions <10 mm and where en bloc resection is feasible by the endoscopist.⁹ Additionally, argon plasma coagulation (APC) has been shown to be effective for small LGAs in several studies,¹¹⁻¹³ and is favored by many physicians in clinical settings when indicated.

The follow-up protocol post-endoscopic resection of LGAs remains ambiguous. The BSG guidelines recommend follow-up examinations one year after resection,⁷ while the ESGE guidelines suggest scheduled endoscopic surveillance post-resection, although they do not specify the intervals.⁹ Conse-

quently, despite ongoing debates regarding the treatment and follow-up of LGAs, no comprehensive studies have yet delineated the overall treatment landscape. This study aims to explore the current management and follow-up practices for gastric LGAs among South Korean gastroenterologists.

METHODS

Study design and data collection

This survey-based study was carried out from March to June 2024. An online questionnaire, developed using Google Forms, was distributed to South Korean gastroenterologists via email or paper instructions with a Quick Response code. The questionnaire, crafted by members of the Research Management Committee of the Korean College of *Helicobacter* and Upper Gastrointestinal Research, addressed various aspects of LGA management. It included 18 questions across four categories: 1) demographics (age, sex, geographic area, and primary practice setting), 2) clinical experience with LGA, 3) treatment for LGA, and 4) follow-up after LGA treatment (Supplementary Material in the online-only Data Supplement). For certain items, including questions on treatment preferences for LGA, multiple responses were allowed to reflect clinical decision-making.

Statistical analysis

Responses were collected and recorded in Microsoft Excel spreadsheets (2019, Microsoft Corp.). The data were subsequently analyzed using IBM SPSS Statistics software for Windows, version 26.0 (IBM Corp.).

Ethical approval

All responses to the survey used in this study were voluntary, and confidentiality of the data was ensured. Participants were provided with an introduction that explained the purpose and content of the study. Before proceeding with the questionnaire, they were required to give their written consent by selecting “yes” or “no.” Ethical approval for the study was granted by the Institutional Review Board (IRB) of the Inje University Haeundae Paik Hospital (HPIRB 2024-02-020-002).

RESULTS

Demographics

The survey included responses from 130 gastroenterologists. The majority of respondents were aged between 30 and 50 years, with 80.8% being male. Geographically, many respondents were from Seoul, Gyeonggi, and Gyeongsang. Most worked in

general hospitals that have more than 500 beds. The average number of ESD procedures performed per month by the respondents was distributed as follows: ≥ 15 procedures (26.3%), 5–14 procedures (39.8%), 2–4 procedures (19.5%), and ≤ 1 procedure (14.4%). Additionally, most respondents had over five years of endoscopic experience, and 61.9% of them had completed >200 cumulative ESD clinical procedures. The baseline characteristics of all respondents are detailed in Table 1.

Criteria for endoscopic treatment and preferred methods of LGAs

A significant majority (68.5%) of gastroenterologists favored resection of LGAs regardless of lesion size. Furthermore, 16.2% recommended resection for lesions ≥ 1 cm, while

Table 1. Demographic and clinical experience of surveyed gastroenterologists

Characteristic	Value (n=130)
Age groups	
30–39 yr	35 (26.9)
40–49 yr	57 (43.8)
50–59 yr	33 (25.4)
≥ 60 yr	5 (3.8)
Sex	
Female	25 (19.2)
Male	105 (80.8)
Geographic area	
Seoul	37 (28.5)
Gyeonggi	28 (21.5)
Gangwon	3 (2.3)
Chungcheong	13 (10.0)
Gyeongsang	39 (30.0)
Cholla	8 (6.2)
Jeju	2 (1.5)
Primary practice setting	
General hospital with ≥ 500 beds	96 (73.8)
General hospital with <500 beds	23 (17.7)
Clinic with outpatient treatment	11 (8.5)
Clinical experience in endoscopy	
<5 yr	19 (14.6)
5–9 yr	31 (23.8)
10–19 yr	44 (33.8)
≥ 20 yr	36 (27.7)
Clinical experience in gastric ESD (cumulative number of cases)	
<50	12 (10.2)
51–99	19 (16.1)
100–199	14 (11.9)
≥ 200	73 (61.9)

Data are presented as n (%).

ESD, endoscopic submucosal dissection.

13.1% preferred resection for lesions ≥ 5 mm (Fig. 1). The primary factors influencing the decision to choose ESD as a treatment method for LGA were lesion size (88.5%), endoscopic findings (62.3%), and location (41.5%), such as the antrum, body, and cardia.

Fig. 2 illustrates the preferred endoscopic resection methods based on lesion size. For lesions ≥ 1.5 cm, 85.3% of respondents favored ESD. For lesions ≤ 1 cm, EMR, modified EMR, or APC were commonly chosen. In more detail, for lesions measuring 0.5–1 cm, 87.7% of respondents preferred EMR or modified EMR, and 16.2% favored APC. For lesions <0.5 cm, 68.5% of respondents chose EMR or modified EMR, 16.2% chose APC, and 10.0% opted for follow-up observation. For lesions measuring 1 to 1.5 cm, EMR and ESD were similarly favored by respondents. Additionally, Fig. 3 shows the preferred methods among respondents who selected modified EMR according to lesion size.

Preferences for endoscopic resection methods also varied based on ESD proficiency (Fig. 4): when categorizing cumulative ESD clinical experience at 200 cases, there was no significant difference in the choice of resection method between respondents with >200 cases of experience and those with ≤ 200 cases. However, more experienced practitioners showed

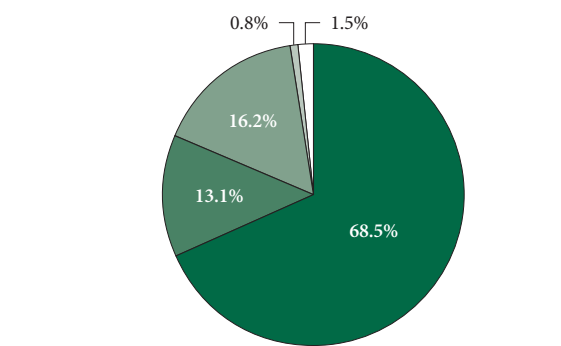


Fig. 1. Size criteria for recommending endoscopic treatment.

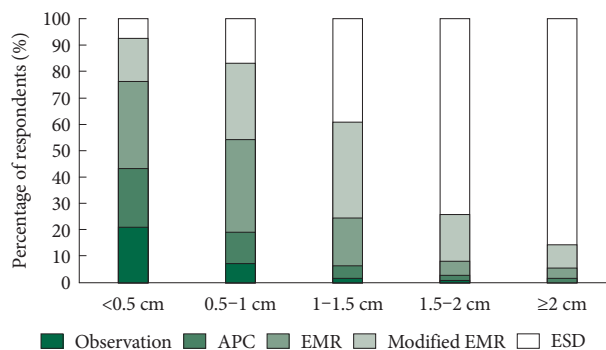


Fig. 2. Preferred endoscopic resection method according to lesion size. APC, argon plasma coagulation; EMR, endoscopic mucosal resection; ESD, endoscopic submucosal dissection.

a slightly higher tendency to opt for observation for lesions <1 cm compared to those with less experience. For lesions >1.5 cm, both groups preferred ESD, although at a lower rate, experienced practitioners were more likely to choose EMR or modified EMR than their less experienced counterparts.

Management of positive resection margins

In cases of pathologically positive resection margins following endoscopic resection, 56.2% of respondents chose APC to address residual suspicious lesions. Meanwhile, 50.0% of gastroenterologists opted for follow-up and observation, 48.5% considered redoing ESD, and 20.8% selected EMR. Fig. 5 displays the management strategies for positive resection margins.

Follow-up strategies and *Helicobacter pylori* eradication

Regarding follow-up endoscopy intervals, 70.0% of respondents conducted endoscopic follow-ups within six months after endoscopic resection, with subsequent endoscopies at yearly intervals. Additionally, 26.9% reported performing follow-up endoscopies annually starting immediately after the procedure (Fig. 6). Responses also varied concerning the end point of follow-up endoscopy after endoscopic treatment: 40.0%

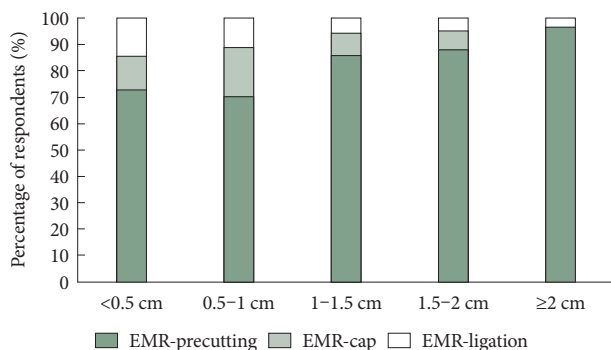
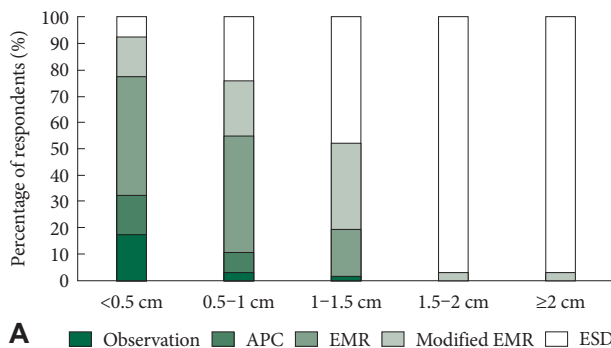


Fig. 3. Preferred modified EMR method according to lesion size. EMR, endoscopic mucosal resection.



A ■ Observation ■ APC ■ EMR ■ Modified EMR ■ ESD

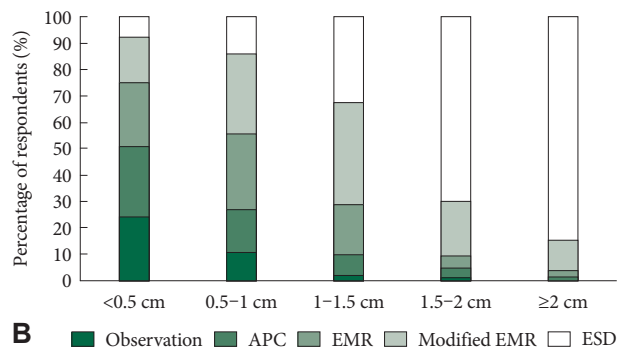
Fig. 4. Preferred endoscopic resection methods according to lesion size and based on proficiency of ESD. Respondents with <200 cumulative ESD cases (A), and respondents with ≥200 cumulative ESD cases (B). APC, argon plasma coagulation; EMR, endoscopic mucosal resection; ESD, endoscopic submucosal dissection.

continued follow-up for more than five years, 29.2% between three and five years, 13.1% for more than two years, while the remaining 13.1% and 4.6% continued for more than one year and six months, respectively. The vast majority of respondents (97.7%) reported administering *H. pylori* eradication therapy to patients with gastric adenomas.

DISCUSSION

For early gastric cancer (EGC), there is consensus on endoscopic resection when indicated, with the recent American Society for Gastrointestinal Endoscopy (ASGE) guidelines recommending the use of EMR or ESD for lesions ≤2 cm without ulcers, and favoring ESD over EMR for lesions ≥2 cm, regardless of ulcer presence.¹⁴ However, the treatment approach for LGAs remains controversial due to their low malignancy risk, unlike HGAs or EGC. Previously, the revised Vienna classification recommended follow-up observation for LGAs, alongside resection based on endoscopic findings or genetic factors.¹⁵ Recent guidelines advocate for endoscopic resection for both HGA and LGA to secure an accurate pathological diagnosis.^{5-7,9} The BSG guidelines recommend complete endoscopic resection for both LGA and HGA.⁷ Additionally, both the ASGE and the ESGE guidelines recommend endoscopic resection for adenomas of any grade or size.^{6,9} While a consensus on endoscopic resection of LGA has been established, detailed criteria for the resection and its methods are not yet clearly defined. This survey revealed the actual clinical practices of LGA management among South Korean gastroenterologists. Approximately 69% of physicians preferred resection for LGAs regardless of lesion size, whereas lesion size was the primary factor influencing the choice of ESD as a treatment method. For lesions >1.5 cm, ESD was the preferred method, while EMR or APC was chosen for lesions <1 cm.

As mentioned earlier, some previous guidelines recommended follow-up rather than treatment for LGAs; however, most



B ■ Observation ■ APC ■ EMR ■ Modified EMR ■ ESD

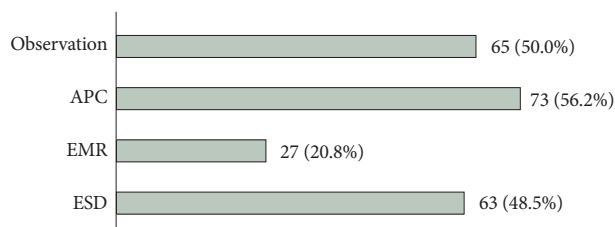


Fig. 5. Management strategies for positive resection margins. APC, argon plasma coagulation; EMR, endoscopic mucosal resection; ESD, endoscopic submucosal dissection.

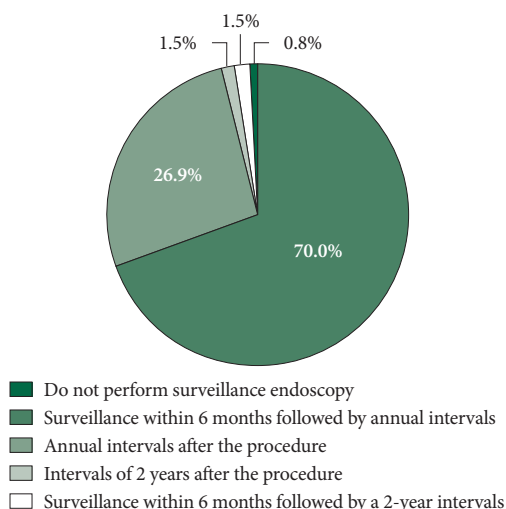


Fig. 6. Follow-up strategies after endoscopic treatment.

recent guidelines now advocate for endoscopic treatment. In this study, the majority of respondents opted for treating LGAs, with 68.5% choosing treatment regardless of lesion size. This decision is largely influenced by concerns about histological discrepancies between pre- and post-endoscopic resection diagnoses. Such discrepancies often occur between the diagnoses from forceps biopsy and the actual resected specimens, where lesions are frequently upgraded histologically following endoscopic resection.⁸ A recent meta-analysis revealed that 25% of lesions initially diagnosed as LGAs were upgraded to more advanced lesions after endoscopic resection; 16.7% were upgraded to HGAs, and 6.9% to cancers.¹⁶ Due to these concerns, the recent ESGE guidelines recommend ESD as the treatment of choice for LGAs of any size, aiming for en bloc resection, with EMR only recommended as an alternative in select cases.⁹

Treatment of LGA varies depending on the size of the lesion, although the criteria are not well-defined. In this study, lesion size was the most critical factor influencing the choice of treatment. The selected treatment method varied with the lesion size. For lesions ≥ 1.5 cm, ESD was preferred over EMR or APC. According to the BSG guidelines, EMR is recommended for gastric adenomas ≤ 1 cm, and ESD is advised for

lesions >1 cm.⁷ Earlier studies from Japan have demonstrated a significantly lower en bloc resection rate with EMR compared to ESD for tumors >1 cm in size.¹⁷⁻¹⁹ Although ESD is technically more challenging than EMR, it achieves a notably higher complete resection rate. Lesion size and surface morphology are important predictors of an upgraded diagnosis following endoscopic resection of LGA. Generally, larger adenomas are believed to have a higher risk of malignant transformation. Specifically, adenomas ≥ 2 cm are known to be independent predictors of upgraded histology.⁸ Some studies have reported that an LGA of ≥ 1 cm is a risk factor for upgrading to HGA or EGC.²⁰⁻²² Additionally, certain surface characteristics such as depression, erythema, irregularity, erosion, or ulceration have been recognized as risk factors for an upgraded histology from gastric LGA to HGA or EGC after endoscopic resection. These surface features, consistent with our study findings, were primary determinants in opting for ESD.

In this study, the treatment of LGA lesions <1.5 cm was heterogeneous. For lesions with sizes of 1–1.5 cm, EMR and ESD were similarly preferred; for those with ≤ 1 cm or smaller, EMR and APC were favored; whereas for those ≤ 0.5 cm, 10.0% of respondents reported opting for follow-up. According to guidelines, EMR is recommended for small LGAs of sizes <1.5 cm; however, APC or observation can serve as alternatives. APC is typically used for LGAs with sizes <1 cm, and, while easy to perform with a relatively low recurrence rate,¹¹⁻¹³ it does not allow for definitive pathological analysis due to the lack of specimen collection. Given the low risk of malignant transformation, some previous guidelines and researchers have recommended annual endoscopic surveillance and re-biopsy for LGA.¹⁵ Nonetheless, most recent guidelines advocate for endoscopic resection. If an LGA is small and its endoscopic characteristics do not suggest high risk, EMR or APC may be viable options, and in certain cases, follow-up might be considered based on the patient's underlying disease or age. Therefore, further evidence and guidelines are needed for the management of small LGAs in the future.

Various methods are used to manage pathologically positive resection margins after endoscopic resection of LGA. In this study, respondents could select multiple options, with approximately 50% preferring observation, APC, and ESD, respectively, while 20.8% chose EMR. Even when en bloc resection is achieved, if the margins are not adequately secured or are damaged during the ablation process, the margins may be considered indeterminate and positive. Consequently, the actual recurrence rate is not high, and about half of the respondents favored observation.

The efficacy of *H. pylori* eradication in preventing metachronous gastric cancer following ESD of gastric adenomas

is not conclusively established. A recent study found no correlation between metachronous gastric cancer after ESD for gastric adenomas and *H. pylori* eradication therapy.²³ According to other reports, *H. pylori* eradication is effective in reducing the occurrence of gastric cancer in patients with gastric adenoma.^{24,25} The recent Maastricht VI/Florence consensus report strongly recommends *H. pylori* eradication therapy following the resection of EGC²⁶; however, the recommendation remains less clear for gastric adenoma. In our study, most respondents reported that they administer *H. pylori* eradication treatment for patients with LGA, which appears to be effective in lowering the incidence of metachronous adenomas or gastric cancer.

Our study has some limitations. First, since the respondents were exclusively South Korean gastroenterologists, the clinical practice patterns of physicians in other countries, particularly Western countries, were not represented. Second, recall bias may have impacted the accuracy of responses, as the respondents were required to rely on their memory when answering certain questions regarding LGA management and surveillance. Finally, although the survey questionnaire was developed by experts, it was not validated.

In conclusion, this study provides insights into the current clinical practices of LGA management among South Korean gastroenterologists. The findings highlight the variability in the management of LGA. However, further research is necessary to develop more standardized guidelines for the management and surveillance of LGA.

Supplementary Materials

The online-only Data Supplement is available with this article at <https://doi.org/10.7704/kjhugr.2025.0021>.

Authors' Contribution

Conceptualization: Jong Yeul Lee, Hyo-Joon Yang. Data curation: Hyo-Joon Yang, Jin Lee. Formal analysis: Hyo-Joon Yang, Jin Lee. Funding acquisition: Jong Yeul Lee, Hyo-Joon Yang. Investigation: Jae Yong Park, Joon Sung Kim. Methodology: Young-Il Kim, Hyuk Lee, Su Youn Nam, Ki Taek Nam. Project administration: Hyo-Joon Yang, Jin Lee. Supervision: Jong Yeul Lee. Validation: Jae Yong Park, Joon Sung Kim. Visualization: Young-Il Kim, Hyuk Lee, Su Youn Nam, Ki Taek Nam. Writing—original draft: Jin Lee. Writing—review & editing: Jong Yeul Lee, Hyo-Joon Yang. Approval of final manuscript: all authors.

ORCID iDs

Jin Lee	https://orcid.org/0000-0003-2404-385X
Jae Yong Park	https://orcid.org/0000-0001-6114-8920
Joon Sung Kim	https://orcid.org/0000-0001-9158-1012
Young-Il Kim	https://orcid.org/0000-0002-2614-3419
Hyuk Lee	https://orcid.org/0000-0003-4271-7205
Su Youn Nam	https://orcid.org/0000-0002-5568-7714
Ki Taek Nam	https://orcid.org/0000-0001-5292-1280
Hyo-Joon Yang	https://orcid.org/0000-0002-0265-672X
Jong Yeul Lee	https://orcid.org/0000-0001-8709-5097

REFERENCES

1. Jung KW, Won YJ, Kong HJ, Lee ES; Community of Population-Based Regional Cancer Registries. Cancer statistics in Korea: incidence, mortality, survival, and prevalence in 2015. *Cancer Res Treat* 2018;50:303-316.
2. Kim SG, Lyu DH, Park CM, et al. Current status of endoscopic submucosal dissection for early gastric cancer in Korea: role and benefits. *Korean J Intern Med* 2019;34:785-793.
3. Park JY, Kim MS, Kim BJ, Kim JG. Influence of procedural volume on the outcome of gastric endoscopic submucosal dissection: a nationwide population-based study using administrative data. *Gastroenterology* 2024;166:680-689.e4.
4. Young E, Philpott H, Singh R. Endoscopic diagnosis and treatment of gastric dysplasia and early cancer: current evidence and what the future may hold. *World J Gastroenterol* 2021;27:5126-5151.
5. Pimentel-Nunes P, Dinis-Ribeiro M, Ponchon T, et al. Endoscopic submucosal dissection: European Society of Gastrointestinal Endoscopy (ESGE) guideline. *Endoscopy* 2015;47:829-854.
6. ASGE Standards of Practice Committee; Evans JA, Chandrasekhara V, et al. The role of endoscopy in the management of premalignant and malignant conditions of the stomach. *Gastrointest Endosc* 2015;82:1-8.
7. Banks M, Graham D, Jansen M, et al. British Society of Gastroenterology guidelines on the diagnosis and management of patients at risk of gastric adenocarcinoma. *Gut* 2019;68:1545-1575.
8. Sung JK. Diagnosis and management of gastric dysplasia. *Korean J Intern Med* 2016;31:201-209.
9. Pimentel-Nunes P, Libânio D, Bastiaansen BAJ, et al. Endoscopic submucosal dissection for superficial gastrointestinal lesions: European Society of Gastrointestinal Endoscopy (ESGE) guideline - update 2022. *Endoscopy* 2022;54:591-622.
10. Dinis-Ribeiro M, Areia M, de Vries AC, et al. Management of precancerous conditions and lesions in the stomach (MAPS): guideline from the European Society of Gastrointestinal Endoscopy (ESGE), European Helicobacter Study Group (EHSG), European Society of Pathology (ESP), and the Sociedade Portuguesa de Endoscopia Digestiva (SPED). *Endoscopy* 2012;44:74-94.
11. Jung SJ, Cho SJ, Choi IJ, et al. Argon plasma coagulation is safe and effective for treating smaller gastric lesions with low-grade dysplasia: a comparison with endoscopic submucosal dissection. *Surg Endosc* 2013;27:1211-1218.
12. Lee DH, Bae WK, Kim JW, et al. The usefulness of argon plasma coagulation compared with endoscopic submucosal dissection to treat gastric adenoma. *Korean J Gastroenterol* 2017;69:283-290.
13. Wang H, Ahn JY, Noh JH, et al. Clinical outcomes of argon plasma coagulation for the treatment of gastric low-grade dysplasia. *Gastrointest Endosc* 2024;100:221-230.e3.
14. ASGE standards of practice committee; Forbes N, Elhanafi SE, et al. American Society for Gastrointestinal Endoscopy guideline on endoscopic submucosal dissection for the management of early esophageal and gastric cancers: summary and recommendations. *Gastrointest Endosc* 2023;98:271-284.
15. Dixon MF. Gastrointestinal epithelial neoplasia: Vienna revisited. *Gut* 2002;51:130-131.
16. Zhao G, Xue M, Hu Y, Lai S, Chen S, Wang L. How commonly is the diagnosis of gastric low grade dysplasia upgraded following endoscopic resection? A meta-analysis. *PLoS One* 2015;10:e0132699.
17. Nakamoto S, Sakai Y, Kusanuki J, et al. Indications for the use of endoscopic mucosal resection for early gastric cancer in Japan: a comparative study with endoscopic submucosal dissection. *Endoscopy* 2009;41:746-750.
18. Shimura T, Sasaki M, Kataoka H, et al. Advantages of endoscopic submucosal dissection over conventional endoscopic mucosal resection. *J Gastroenterol Hepatol* 2007;22:821-826.

19. Watanabe K, Ogata S, Kawazoe S, et al. Clinical outcomes of EMR for gastric tumors: historical pilot evaluation between endoscopic submucosal dissection and conventional mucosal resection. *Gastrointest Endosc* 2006;63:776-782.
20. Cho SJ, Choi IJ, Kim CG, et al. Risk of high-grade dysplasia or carcinoma in gastric biopsy-proven low-grade dysplasia: an analysis using the Vienna classification. *Endoscopy* 2011;43:465-471.
21. Choi CW, Kim HW, Shin DH, et al. The risk factors for discrepancy after endoscopic submucosal dissection of gastric category 3 lesion (low grade dysplasia). *Dig Dis Sci* 2014;59:421-427.
22. Min BH, Kim KM, Kim ER, et al. Endoscopic and histopathological characteristics suggesting the presence of gastric mucosal high grade neoplasia foci in cases initially diagnosed as gastric mucosal low grade neoplasia by forceps biopsy in Korea. *J Gastroenterol* 2011;46:17-24.
23. Noh CK, Lee E, Park B, et al. Effect of *Helicobacter pylori* eradication treatment on metachronous gastric neoplasm prevention following endoscopic submucosal dissection for gastric adenoma. *J Clin Med* 2023;12:1512.
24. Shin SH, Jung DH, Kim JH, et al. *Helicobacter pylori* eradication prevents metachronous gastric neoplasms after endoscopic resection of gastric dysplasia. *PLoS One* 2015;10:e0143257.
25. Bae SE, Jung HY, Kang J, et al. Effect of *Helicobacter pylori* eradication on metachronous recurrence after endoscopic resection of gastric neoplasm. *Am J Gastroenterol* 2014;109:60-67.
26. Malfertheiner P, Megraud F, Rokkas T, et al. Management of *Helicobacter pylori* infection: the Maastricht VI/Florence consensus report. *Gut* 2022;71:1724-1762.