

Long-Term Results of Endoscopic Resection in Early Gastric Cancer: The Western Experience

Hendrik Manner, MD^{1,6}, Thomas Rabenstein, MD, PhD^{2,6}, Andrea May, MD, PhD¹, Oliver Pech, MD, PhD¹, Liebwin Gossner, MD, PhD³, Daniel Werk, MD⁴, Nicola Manner, MD¹, Erwin Günter, MD¹, Jürgen Pohl, MD, PhD¹, Michael Vieth, MD, PhD⁵, Manfred Stolte, MD, PhD⁵ and Christian Ell, MD, PhD¹

- OBJECTIVES:** In the West, neither acute nor long-term results of endoscopic resection (ER) for early gastric cancer (EGC) have been reported in large studies. The aim of this study was to prospectively evaluate the efficacy and safety of ER in patients with EGC in a long-term follow-up (FU).
- METHODS:** From May 1995 to October 2004, 179 patients were referred to our department for endoscopic therapy (ET) of gastric cancer (GC). Of these, 43 patients had intramucosal GC with a diameter of up to 30 mm and underwent ER with curative intent. All patients underwent a strict FU protocol at regular intervals.
- RESULTS:** Of the 43 patients, 42 fulfilled our low-risk criteria for ET of EGC: gross tumor type I/II, intramucosal GC, diameter up to 30 mm, tumor differentiation G1/G2, and no infiltration into lymph vessels/veins. Two patients were not available for FU (remission status not evaluated). In another patient, gastric mucosa-associated lymphoid tissue lymphoma was detected simultaneously, and he was referred for surgery. 38 (97%) of the remaining 39 patients who underwent definitive ET (23 males (59%); mean age 69±10 years) achieved complete remission (CR) after a mean of 1.3±0.6 ER sessions. Minor complications (not Hb-relevant bleeding) occurred in 7 of the 39 patients (18%) and major complications (5 Hb-relevant bleeds, 1 covered perforation; all managed conservatively) in 6 patients (15%). During FUs (mean 57 months; range 5–137), recurrent or metachronous lesions were observed in 11 patients (29%). All lesions were successfully treated by repeated ET. No tumor-related deaths occurred during FU.
- CONCLUSIONS:** Although ER for EGC in Western countries is effective, it is associated with a relevant risk of complications. In view of the possibility of recurrent or metachronous neoplasia, a strict FU protocol is mandatory.

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INTRODUCTION

Gastric cancer is the second leading cause of cancer-related deaths in the world. The highest incidence rates are observed in Asia. The age-adjusted standardized rate in Northern America and Europe ranges between 7.4 and 12.8 per 100,000, respectively (1).

The term “early gastric cancer” (EGC) refers to tumor confined to the mucosa or submucosa, regardless of the presence or absence of regional lymph node metastasis (2). Surgery is considered as the gold standard treatment for EGC (3–7).

Owing to the low incidence of nodal metastasis of intramucosal EGC (3%) (8), the necessity of surgical resection has been questioned. Surgery carries significant risks of morbidity and mortality, and is associated with long-term reduction in patients’ quality of life (9–14).

After its introduction 20 years ago as an organ-preserving treatment approach (15), endoscopic resection (ER) has become the standard treatment for EGC in Japan, with very high disease-specific survival rates observed (16–18). According to the Japanese gastric cancer treatment guidelines (19), ER

¹Department of Internal Medicine II, Dr. Horst-Schmidt-Kliniken, Teaching Hospital of the University of Mainz, Wiesbaden, Germany; ²Department of Internal Medicine, Evangelische Diakonissenanstalt, Speyer, Germany; ³Department of Medicine I, Klinikum Karlsruhe, Karlsruhe, Germany; ⁴Asklepios Gesundheitszentrum, Wiesbaden, Germany; ⁵Institute of Pathology, Bayreuth Hospital, Bayreuth, Germany; ⁶These authors contributed equally to this work. **Correspondence:** Hendrik Manner, MD, Klinik Innere Medizin II, HSK Wiesbaden, Ludwig-Erhard-Strasse 100, Wiesbaden 65199, Germany. E-mail: HSManner@gmx.de

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Table 1. Criteria for endoscopic treatment of EGC

Expanded Japanese criteria for local treatment for EGC ²⁰	Wiesbaden low-risk criteria for endoscopic treatment of EGC
Intramucosal cancer Differentiated adenocarcinoma No lymphatic-vascular invasion irrespective of ulcer findings tumor size <3cm	Intramucosal cancer Tumor size ≤3 cm Gross type I/II (IIa, IIb, IIc, and any combination of types I and II) Well- or moderately differentiated adenocarcinoma (G1–G2) Absence of infiltration into lymph vessels or veins
Intramucosal cancer Differentiated adenocarcinoma No lymphatic-vascular invasion without ulcer findings irrespective of tumor size	
Undifferentiated intramucosal cancer No lymphatic-vascular invasion without ulcer findings tumor size <2cm	
Minute sm invasion (sm1, <500 μm) Differentiated adenocarcinoma No lymphatic-vascular invasion tumor <3 cm	

EGC, early gastric cancer; sm, submucosal.

traditionally is indicated for lesions up to 20 mm in diameter and with no concomitant lymph-node metastasis. Using a large database involving more than 5,000 patients who underwent gastrectomy with lymph node dissection for EGC, Gotoda *et al.* (20) were able to clarify the risks of lymph node metastasis and proposed even criteria of extended indications for local treatment of EGC (Table 1).

In the western world, neither acute nor long-term data on ER for EGC have been reported in large series (21). The aim of this study was to prospectively evaluate efficacy and safety of ER in patients with EGC in a long-term follow-up (FU).

METHODS

Patients

Over a 9-year period between May 1995 and October 2004, a total of 179 patients were referred to our department for endoscopic therapy (ET) of histologically proven gastric cancer (Figure 1). None of the patients had received treatment for gastric cancer before the referral.

In 45 of the patients, mucosal cancer was detected in the histological specimen of initial ER. Two of the 45 patients had a tumor size more than 3 cm. These patients were scheduled for palliative ET instead of gastrectomy because of the high age of patients, and argon plasma coagulation (APC) and laser treatment were carried out.

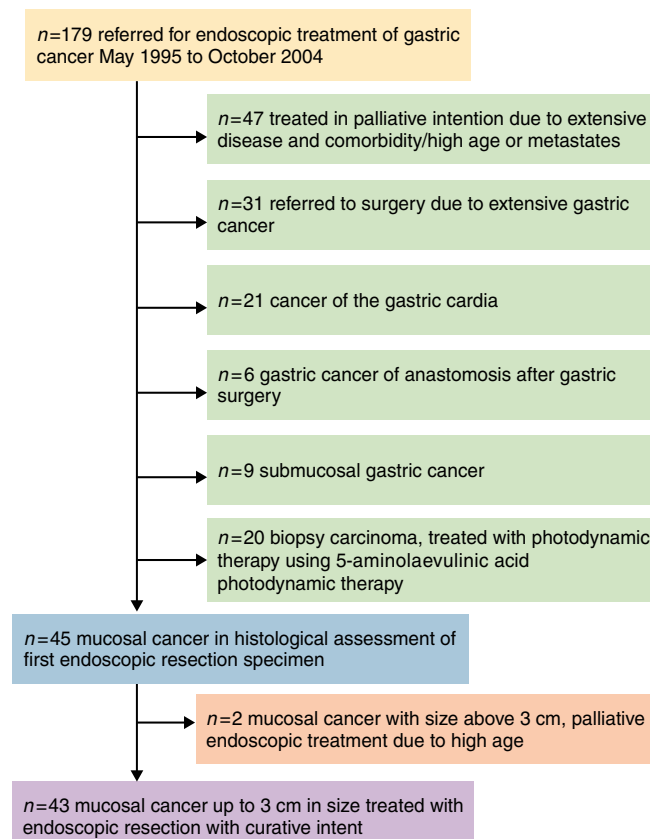


Figure 1. Overview of patients referred for endoscopic treatment of gastric cancer May 1995 to October 2004.

In 43 of the 45 patients with mucosal EGC, a maximum tumor size of 3 cm was detected using a 7-mm forceps for measuring the tumor size endoscopically. In these patients, ER was carried out in a curative intent.

Staging procedures

All of the patients underwent a careful staging protocol before ER, using videoendoscopy, chromoendoscopy with indigo carmine 0.5% of the whole stomach, endoscopic ultrasound (EUS), and radiographic procedures.

During videoendoscopy and chromoendoscopy, biopsies were taken from all macroscopically evident lesions and from discolored areas. Assessment of the biopsy specimens was carried out independently by two different pathologists. Histologic criteria, classification, and assessment of the grade of differentiation corresponded to the World Health Organization (WHO) classification (22).

Of the 43 patients, 28 (65%) with intramucosal gastric cancer were *Helicobacter pylori*-positive, and eradication therapy (“French” or “Italian” triple therapy) was administered, either before referral to our department (8 patients) or at the beginning of treatment (20 patients).

Endoscopes used during the study were Fujinon EG-450HR instruments (Fujinon Europe Inc. Willich, Germany) or

Table 2. Japanese classification for gastric carcinoma

Type of lesion	Classification
Polypoid	Type I
Flat and slightly elevated	Type IIa
Flat and level	Type IIb
Flat and depressed	Type IIc
Flat and slightly elevated and depressed	Type IIa+c
Ulcerated	Type III

Olympus 130 and 140 instruments at the beginning of the study (Olympus Inc., Hamburg, Germany).

The gross tumor type was assessed according to the Japanese Classification of Gastric Carcinoma (23) (Table 2). The complete stomach was investigated intensely to rule out multifocal neoplasia. All endoscopies (also in case of intervention) were performed under mild sedation (midazolam 1–10 mg and/or pethidine 25–50 mg) and *N*-butylscopolamine 20–40 mg, all of these administered intravenously.

EUS using the conventional radial scanner was performed (Olympus UM20, 12.5 MHz; Olympus) to rule out regional lymph node metastasis. In addition, EUS using a 20-MHz probe (Fujinon VSP-701) was carried out to assess the depth of tumor invasion of lesions identified at endoscopy.

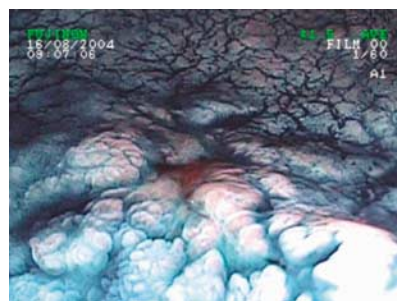
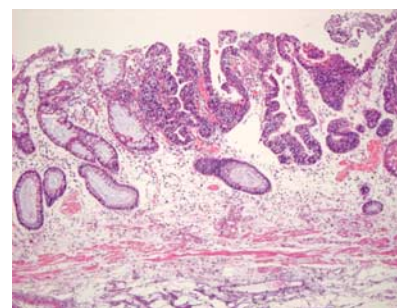
Chest radiography, computed tomography of the abdomen (Twin Flash; Elscint Inc., Wiesbaden, Germany), and an ultrasound examination of the abdomen (HDI 3000; ATL Inc., Solingen, Germany) were carried out in all patients to exclude metastatic disease.

Patients were defined not to be eligible for curative ET in the actual study if the staging examinations showed evidence of, or raised a suspicion of, a more advanced local tumor stage. This included the suspicion of deep invasion into the submucosal layer (EUS). Also, in case of suspicion of lymph node involvement (EUS) or suspicion of metastatic disease (computed tomography scan/abdominal ultrasound), an exclusion criterion for local ET was met. Then the patients were scheduled for surgical resection if they were generally operable, or for palliative ET or radiochemotherapy if they were inoperable or refused surgery.

Endoscopic treatment

After completion of the pre-interventional staging protocol, initial ER was carried out. During at least one information discussion, all of the patients received extensive written and oral information indicating that gastrectomy is the current gold standard, and that ET is an experimental procedure that has to be carried out under research conditions. If patients were interested in obtaining a second opinion, surgeons were regularly asked to discuss all the issues once again with the patients. All of the patients gave written consent to local therapy.

ER was carried out by endoscopists experienced in ER, using snare resection or the “suck-and-cut” technique, the latter

**Figure 2.** Endoscopic finding of early gastric cancer (indigo carmine dye).**Figure 3.** Endoscopic finding after endoscopic resection (ER) of early gastric cancer (piecemeal resection).**Figure 4.** Histological assessment showing mucosal gastric cancer.

either with a ligation device or with a cap system. The use of simple snare resection was not continued during the course of the study, because only small ER specimens may be obtained by this technique (10,24–26). In individual cases, marking dots were made around the lesion by APC before resection. After ER, the resection specimen was fixed on an underlying plate using thin needles. In case of piecemeal resection (Figures 2 and 3), the resected tumor was reconstructed.

Histomorphological assessments of the resected specimens (Figure 4) were carried out by MV and MS. Hematoxylin and eosin staining was used in all cases. If required, immunohistochemistry using the marker “LEM D2-40” (IgG1, kappa, endothelial marker for lymphatic vessels, M 6319; Dako, Hamburg, Germany) was carried out in order to be able to histologically separate lymphatic vessels from shrinking artifacts occurring in the specimen. After having marked the basal

margin of each individual resection specimen with India ink, the resection specimen was embedded in slices of 1.5 mm thickness, and these slices were sectioned twice. The assessment included depth of tumor invasion, freedom from tumor on the lateral and basal resection margins of the specimen (R0/R1 status), the tumor's grade of differentiation, and involvement of the lymphatic vessels (L status) and veins (V status). A T1a stage (mucosal cancer) was defined as cancer that invades the lamina propria but not through the muscularis mucosae. T1b (submucosal cancer) was defined as cancer that extends through the muscularis mucosae into the submucosa but does not invade the muscularis propria.

If there was evidence of a more advanced local tumor stage after initial ER, patients were defined not to be eligible for further ET with curative intent. This included the histological presence of tumor at the basal margins of ER. Patients were also excluded if high-risk criteria, such as invasion into lymphatic vessels or veins, and a low tumor differentiation in case of a tumor size above 2 cm, were present. In case of exclusion from further ET with curative intent, the patients were scheduled for surgery, or for palliative ET or radiochemotherapy if they were inoperable or refused surgery.

In the case of incipient submucosal invasion (maximum depth of invasion into the submucosa $\leq 500 \mu\text{m}$) and the absence of tumor at the basal margins of ER, the patients were either treated endoscopically under prospective study conditions (data not yet published) or referred to surgery (the current gold standard).

In all of the ET procedures, concomitant acid-suppressing treatment with intravenous proton pump inhibitors ($2 \times 40 \text{ mg/day}$ omeprazole or $2 \times 40 \text{ mg/day}$ pantoprazole) was administered for 2 days, after which proton pump inhibitors were administered orally in a dose of $2 \times 40 \text{ mg}$ for 2 weeks after ET, and $1 \times 40 \text{ mg}$ thereafter.

On the day of ER, the patients were only allowed to drink. On the following day, check-up endoscopy was carried out to assess the effectiveness of the treatment and exclude bleeding, visible vessels, or perforation before the patient was discharged from hospital.

In individual cases, ET was completed by additional APC or laser treatment. These techniques were used for ablation of small remnants of neoplastic tissue at the margins of ER, or when repeated ER was not possible because of scarring in the area of pretreatment.

FU

All of the patients were included in a strict FU program in collaboration with the referring gastroenterologists. FU examinations were performed every 3 months within the first 2 years after treatment. After this period, the patients received check-up examinations at 6-monthly intervals up to the end of a 5-year period, and then annually. The examinations included endoscopy with chromoendoscopy (Indigo carmine 0.5%) of the whole stomach with biopsies around the ER margins at each check-up. Computed tomography, EUS, and abdominal ultrasound were performed every 6 months for 2 years, and then annually.

Complete remission (CR) was defined to have been obtained when the resected specimen showed completely tumor-free deep and lateral margins (R0 status), and the biopsies from the first FU examination gave no evidence of residual or other severe intraepithelial neoplasia or carcinoma. If the deep margin was tumor-free (R0 basal), but neoplastic tissue extended to the lateral resection margins (R1 lateral), or if adequate assessment of the lateral margins was not possible because of coagulation effects (RX lateral), there had to be no evidence of neoplasia at two further FU examinations to fulfill the criterion of CR. In patients who underwent additional APC treatment because of minimal residual malignant lesions at the margins of ER, the biopsies from two further FU examinations had to be free of neoplasia.

If any of the FU examinations revealed residual neoplastic tissue or secondary malignant lesions (metachronous or recurrent lesions), local ET was repeated after the patient had been provided with appropriate information. Metachronous lesions were defined as neoplastic lesions high-grade intraepithelial neoplasia ((HGIN)/early cancer) that developed in other localizations of the stomach during FU, or that might not have been detected during initial staging. Lesions occurring near the primary site of the neoplasia, for example, at the margin of a scar after ER, were defined as recurrent.

ET was defined to have failed if the treatment strategy had to be changed to surgery after initial ET with curative intent.

Statistical analysis and ethical considerations

All evaluated patients' and treatment characteristics were prospectively documented in a dedicated database throughout the study period. The primary target criterion of the study was the response rate (number of complete remissions) after completion of the treatment. All secondary target criteria were evaluated descriptively. Arithmetic means, standard deviation, minimum and maximum, or absolute and relative frequencies were reported, depending on the scale level of the characteristics. Survival rates were calculated using Kaplan–Meier curves for life-table analysis (SPSS 10.0; SPSS Inc., Chicago, IL).

The study was carried out in accordance with good clinical practice criteria. It was based on the approval for our study on local ET of early malignancy in the upper gastrointestinal tract. This approval had been received from the Ethics Committee of the General Medical Council of the state of Hesse, Germany, before the start of the clinical trial.

RESULTS

Of the 43 patients, 42 with intramucosal gastric cancer who underwent ER with a curative intent fulfilled our criteria of "low-risk" EGC (**Table 1**). In one of the 43 patients, a low tumor differentiation (mixed tumor type of adenocarcinoma and signet cell cancer) was detected. Owing to the small tumor size (less than 2 cm in diameter), the decision was made to continue curative endoscopic treatment. After one ER session, CR was achieved. After 38 months, recurrence of malignancy was found histologically, and the patient was referred to surgery.

In 2 of the 42 patients fulfilling our low-risk criteria, no FU examination was carried out after initial ER because of the patients' wishes, and the status of remission could not be evaluated. In one patient having a negative *H. pylori* status, a gastric mucosa-associated lymphoid tissue lymphoma was detected simultaneously during the treatment period. This patient was referred to surgery for gastrectomy.

In the remaining 39 patients (23 males, 59%; 16 females, 41%), the remission status could be evaluated. The mean age of patients was 68.7±10 years (range 36–85). The characteristics of the neoplastic lesions observed and the treatment modalities chosen in the 39 patients are shown in **Table 3**.

Minor complications following ER were observed in 7/39 patients (18%). In all those patients, bleeding at the treatment (ER) site was observed, which was not Hb-relevant bleeding (decrease in the Hb level <2g/dl), and did not require blood transfusion. In five of the patients, endoscopic injection therapy using epinephrine-saline solution was carried out.

In six patients (15%), major complications were observed: bleeding at the ER site that was Hb-relevant bleeding (decrease in the Hb level >2g/dl) and/or required transfusion therapy was observed in five patients. All bleedings were stopped successfully using injection therapy. In one patient, a covered perforation (endoscopically no open view into the abdomen) was observed 1 day after ER. A nasoduodenal tube was inserted, and intravenous antibiotic therapy was administered for a period of 6 days (claforane 2×2g per day). Then the patient was discharged from hospital.

In 38/39 patients (97%), CR was achieved after a mean treatment duration of 3.5±3.8 months (range 1–16) and a mean of 1.3±0.6 ER sessions (range 1–3). In one patient, CR was not achieved endoscopically. In the ER specimen of the third ER, histological assessment showed a tumor invasion in the mid-third of the submucosa (sm2 lesion), and the basal margins of the ER specimens were not tumor-free (R1 basal status). The patient was therefore referred to surgery.

The mean FU in the 38 patients who achieved CR was 57±28 months (range 5–137). Secondary lesions were observed in 11 patients (29%) during FU after a mean of 44±31 months (range 2–117). Recurrent lesions were found in 9/38 patients (24%), and metachronous lesions in 2/38 patients (5%). All secondary lesions were treated successfully by repeated ET using APC in seven patients (one session per patient), ER in two patients (one session per patient), ER and additive APC treatment in one patient (two endoscopy sessions), and KTP laser treatment in one patient (one session).

After having achieved CR, a total of 7/38 patients (18%) died from a non-tumor-related cause. The majority of patients (four cases) died from cardiac disease. One patient died from a cerebral stroke. In one patient, dementia had led to wasting and death. In another patient, multiorgan failure had been identified as the cause of death. All these patients had been tumor-free, undergoing FU endoscopy examinations in regular intervals until the time of death.

Table 3. Overview of tumor and treatment characteristics in 39 patients with “low-risk” EGC and complete evaluation of remission status

Localization of gastric cancer	Antrum: 17 (43.6%)	
	Angulus: 5 (12.8%)	
	Corpus: 16 (41%)	
	Antrum and corpus: 1 (2.6%)	
Number of lesions	One lesion: 34 (87.2%)	
	Bifocal cancer: 4 (10.3%)	
	Multifocal cancer: 1 (2.6%)	
Classification of gross tumor type according to the Japanese Classification for early gastric cancer	Type I: 5 (12.8%)	Type IIa: 9 (23.1%)
	Type II: 34 (87.2%)	Type IIb: 4 (10.3%)
		Type IIc: 4 (10.3%)
		Type IIa+c: 16 (4.1%)
		Type IIa+b: 1 (2.6%)
Tumor differentiation (grading)	G1: 28 (71.8%)	
	G2: 11 (28.2%)	
ER technique	Cap resection after submucosal injection: 22 (56.4%)	
	Resection after ligation: 14 (35.9%)	
	Snare resection after submucosal injection: 3 (7.7%)	
Completeness of resection	En bloc resection (ER in one piece): 23 (59%)	
	Piecemeal resection: 16 (41%)	
Histological assessment of R lateral status in first ER specimen	R0 lateral: 12 (30.8%)	
	R1 lateral: 14 (35.9%)	
	RX lateral: 13 (33.3%)	

EGC, early gastric cancer; ER, endoscopic resection. Values are expressed as *n* (%), where *n* denotes number of patients.

In an intention-to-treat analysis, 38/43 patients with mucosal gastric cancer who underwent ER in a curative intent achieved CR (88%). The calculated 5-year survival rate of the 43 patients was 74%. No tumor-related death occurred.

DISCUSSION

Neither acute nor long-term data on the safety and efficacy of ER for EGC have been reported in larger series in the West.

The aim of this study was to prospectively evaluate efficacy and safety of ER for EGC in the short and long term.

Our results show that ER for EGC can be performed effectively and also safely in a western setting if patients are selected properly. Of the 39 patients, 38 with low-risk EGC (97%) who underwent definite endoscopic treatment achieved CR after a mean of 1.3 ER sessions. Although there was a relevant rate of treatment-related complications, no treatment or cancer-related deaths occurred.

The actual study confirms that, in most cases, complications after ER of EGC can be successfully managed conservatively or endoscopically (27). Minor complications presenting as not Hb-relevant bleedings occurred in 18% of our patients, and major complications (Hb-relevant bleedings, one covered perforation) in 15%. No surgical intervention was required in any of our patients.

Bleeding is the most common complication of ER, occurring in approximately 8% of patients (27). In our patients, Hb-relevant bleeding (decrease in the Hb level >2g/dl) occurred in 12.9% of cases. This relatively high rate might be associated with the relatively low number of cases treated compared with Japanese reports. Interestingly, in comparison to reports on ER for early Barrett's carcinoma, the complication rate observed was higher (26,28). On the other hand, our results confirm that perforation is uncommon during ER (27). The risk of perforation has been reported as about 0.5% in standard ER procedures (17). In our patient, covered perforation was managed conservatively without the use of endoclips (29).

The question arises how the risk of complications during suck-and-cut ER may generally be reduced. In our personal experience, submucosal injection of diluted epinephrine-saline solution (1:100,000) before the procedure helps reducing the risk of procedure-related bleeding and perforation.

In addition, this study confirms that there is a relevant risk of metachronous and recurrent neoplasia after ER of EGC. The incidence of multiple primary lesions in surgically treated EGC has been reported to be approximately 10% (30). Synchronous tumors may be missed at initial examination. The risk of local recurrence after ER is reported to vary between 2 and 35% (17,18).

Nasu *et al.* (31) followed-up 143 patients with EGC; 24% of patients had synchronous and/or metachronous multiple gastric cancers. In this study, metachronous lesions occurred in 5% of patients and recurrent lesions in 24%. All of these lesions were successfully treated using ET. In order to be able to detect all secondary lesions, a strict FU protocol including high-resolution endoscopy and chromoendoscopy is required for all patients.

Fukase *et al.* (32) investigated the prophylactic effect of HP eradication on the development of metachronous gastric carcinoma after ER for EGC. A total of 544 patients with EGC, either newly diagnosed and planning to have endoscopic treatment or in post-resection FU after endoscopic treatment, were randomly assigned to receive an HP eradication regimen or control. At 3-year FU, metachronous gastric carcinoma had developed

in nine patients in the eradication group and 24 in the control group. In the full intention-to-treat population, the odds ratio for metachronous gastric carcinoma was 0.353. In the modified intention-to-treat population, including patients with at least one post-randomization assessment of tumor status and adjusting for loss to FU, the hazard ratio for metachronous gastric carcinoma was 0.339. The authors concluded that prophylactic eradication of *H. pylori* after ER of EGC should be used to prevent the development of metachronous gastric carcinoma.

In comparison to standard ER, endoscopic submucosal dissection (ESD) has been reported to prevent disease recurrence more effectively by achieving large en bloc resections (18). If only piecemeal removal of tumor is achievable, this does not comply with the general oncological principle of complete resection in one piece with sufficient safety margins. The local recurrence rate after piecemeal resection by ER is reportedly higher than after en bloc resection (33). Kojima *et al.* (17) reported that en bloc resection was achieved by ER in 76% of cases reported in the Japanese literature. In the actual study, 23 of 39 patients (59%) had removed their lesions en bloc. Clear lateral margins (R0 resection) after the first ER session were observed in 30.8% of patients. Therefore, the question arises whether the rate of R0 resections would have been increased by systematic marking of tumor margins before ER in our patients. In general, the exact assessment of tumor margins before ER is essential to keep the rate of recurrences as low as possible.

In Japan, ESD is now frequently chosen over standard ER for EGC treatment. Major problems of ESD compared with ER are that it requires significant additional technical skills and a significant longer procedure time (18). Moreover, ESD appears to be associated with a higher risk of complications such as perforation and bleeding (18). In a retrospective analysis of 1,020 gastric cancers resected endoscopically, the incidence of intra-operative bleeding was significantly higher with ESD (22.6%) than with ER (7.6%) (18). In cases with ulceration, the incidence of perforation was significantly higher with ESD (53.8%) than with ER (2.9%). Last but not least, experience with ESD is still very limited in the West, and long-term results are lacking (34,35).

Independently from the resection technique used, the major advantage of standard ER as well as ESD is their ability to provide pathological staging without precluding future surgical therapy (36). Other endoscopic techniques, such as APC (37,38) or photodynamic therapy (39), have also been reported to cure EGC, but they do not provide pathological specimens.

The question arises which kind of treatment should be chosen in case of recurrence of EGC after ER. Surgery, which has been the preferred therapy, may be excessive because recurrence may only involve the mucosa (40). Our study shows that all recurrent lesions could successfully be treated using repeated ET. Nevertheless, repeated recurrence of EGC has been reported after ER (40), and ESD might be a promising perspective in such cases.

In addition to patients meeting the low-risk criteria, a further possible indication for ER might be EGC with incipient infiltration into the submucosa ($\leq 500 \mu\text{m}$) (20). A prerequisite for such

a treatment is that no further risk factors for LNM such as lymph vessel infiltration or low tumor differentiation are present (41). As no long-term data on the ET of this group of patients exist to date in the West, treatment should only be carried out under study conditions in highly experienced endoscopic centers.

A limitation of this study might be the small number of patients included compared with Japanese reports (17,33). On the other hand, considering that these are the first long-term data reported in the West, the series is relatively large. The fact that, over almost a 9-year period, only 43 patients were found to have intramucosal cancer in our center, points out the relative rareness of this disease.

To date, no randomized controlled trial comparing ER with gastrectomy as the current gold standard for treatment of early EGC exists. In view of the excellent long-term results of ER (16,17) and the fact that the possibility of surgery is not excluded in patients after initial ER, the necessity of such a trial may be questioned.

In conclusion, ER for EGC appears to be effective also in a western setting, but is associated with a relevant risk of complications. In view of the possibility of recurrent or metachronous neoplasia, a rigorous FU protocol is mandatory.

CONFLICT OF INTEREST

Guarantor of the article: Christian Ell, MD, PhD.

Specific author contributions: Hendrik Manner and Thomas Rabenstein planned and conducted the study and drafted the paper. Andrea May, Oliver Pech, Liebwin Gossner, Daniel Werk, Nicola Manner, Erwin Guenter, Jürgen Pohl, Michael Vieth, Manfred Stolte, and Christian Ell planned and conducted the study. All authors approved the final version of the paper.

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Study Highlights

WHAT IS CURRENT KNOWLEDGE

- ✓ Endoscopic resection has become the standard treatment for early gastric cancer in Japan.

WHAT IS NEW HERE

- ✓ Endoscopic resection for early gastric cancer also appears to be effective in Western countries, but it is associated with a relevant risk of complications and recurrent or metachronous neoplasia.

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