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## Laparoscopic and endoscopic cooperative surgery for full-thickness resection and sentinel node dissection for early gastric cancer

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### Abstract

The endoscopic submucosal dissection (ESD) technique has become the gold standard for submucosal tumors that have negligible risk of lymph node metastasis (LNM), due to its minimal invasiveness and ability to improve quality of life. However, this technique is limited in stage T1 cancers that have a low risk of LNM. Endoscopic full thickness resection can be achieved with laparoscopic endoscopic cooperative surgery (LECS), which combines laparoscopic gastric wall resection and ESD. In LECS, the surgical margins from the tumor are clearly achieved while performing organ-preserving surgery. To overcome the limitation of classical LECS, namely the opening of the gastric wall during the procedure, which increases the risk of peritoneal tumor seeding, non-exposed endoscopic wall-inversion surgery was developed. With this full-thickness resection technique, contact between the intra-abdominal space and the intragastric space was eliminated.

**Key Words:** Endoscopic submucosal dissection; Laparoscopic endoscopic cooperative surgery; Non-exposed endoscopic wall-inversion surgery; Early gastric cancer; Nodal basin evaluation

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**Core Tip:** The initial indication for laparoscopic endoscopic cooperative surgery (LECS) was gastric submucosal tumors (SMTs) without ulcerative features. Later, the LECS procedure was expanded to include gastric SMTs with ulceration and gastric cancer (GC) with negligible risk of lymph node metastasis. Currently, LECS can be applied to early GC in which sentinel node (surgical nodal basin) dissection can be performed with intra-operative evaluation by one-step nucleic acid amplification. Modified LECS procedures have been developed, such as inverted LECS, non-exposed endoscopic wall-inversion surgery, a combination of laparoscopic and endoscopic approaches to neoplasia with a non-exposure technique, and closed LECS.

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## TO THE EDITOR

We read with great interest the retrospective study by Inokuchi *et al*[1], which evaluated the feasibility and efficacy of gastric endoscopic submucosal dissection (ESD) in patients aged  $\geq 80$  years. The study was based on 172 sessions of gastric ESD in 124 patients, with a final diagnosis of gastric cancer (GC) in 175 Lesions. The patients were studied retrospectively to evaluate short-term outcomes (procedure-related mortality, complications, curative dissection and rates of *en bloc* dissection) and survival. In the study, there was a high *en bloc* dissection rate (97.1%) and a curative dissection rate of 77.1%. Complications occurred in 8 patients (4.7%). There were 6 cases (3.4%) of postoperative bleeding, 2 (1.1%) of intraoperative perforation, and 1 (0.6%) of aspiration pneumonitis after ESD. There were no procedure-related deaths[1]. The significant risk factors that increased the rates of bleeding were tumor location in the lower third of the stomach, lesions  $> 40$  mm, presence of a depressive component, and ulcerative features. The main risk factor for perforation was the site in the upper third of the stomach[1]. To evaluate long-term outcomes, the patients were divided into two groups: curative group ( $n = 87$ ) and non-curative (without additional surgery) ESD group ( $n = 33$ ). The overall survival rate was strongly predicted by the Charlson Comorbidity Index (CCI). Patients with  $CCI \geq 2$  had a poor prognosis, regardless of curability. The conclusion of the study underlines that ESD is feasible even in elderly patients aged  $> 80$  years, without an increase in complications.

It is clear why, over the years, the ESD technique has become the gold standard for submucosal tumors with negligible risk of lymph node metastasis (LNM), namely its minimal invasiveness and ability to improve quality of life. We agree with the importance of ESD, but this technique is limited in stage T1 cancers that have a low risk of developing LNM.

The laparoscopic endoscopic cooperative surgery (LECS) approach was melt, for the treatment of gastric submucosal tumors (SMTs), from fusion of ESD and surgery to endoscopic identification of the resection line and laparoscopic resection of gastric wall[2-4]. LECS begins with the endoscopic pre-cut around the tumor and section of the gastric wall. Then, with a laparoscopic approach, the tumor is excised and the gastric wall defect is reconstructed with a mechanical stapler. The advantage is that there are no limitations on tumor location[5]. LECS was used initially for the SMTs without ulceration [6]. Subsequently, the indication was expanded to also include lesions with ulcerative features and GC with very low risk of LNM[7,8]. The limitation of classical LECS includes the possibility of tumor and gastric content contamination into the peritoneal cavity because of the opening of the gastric wall during the procedure, increasing the risk of peritoneal tumor seeding. Therefore, some modified LECS procedures have been developed, such as inverted LECS[7], non-exposed endoscopic wall-inversion surgery (NEWS)[9-11], a combination of laparoscopic and endoscopic approaches to neoplasia with a non-exposure technique[12], and closed LECS[13].

The NEWS technique allows full thickness resection avoiding contamination of the intra-abdominal region with intragastric material. This procedure does not require intentional perforation, avoiding the risk of tumor seeding. Saline solution is injected endoscopically into the submucosa to mark the lesion margins. In the next step, the section of the outer layers of the wall and their suture are performed laparoscopically in such a way as to invert the early GC (EGC) towards the inside of the stomach. The last step is represented by the removal of the specimen by the ESD approach and closure of the defect with clips or nets. NEWS has the advantage of avoiding peritoneal contamination and cancer cell seeding. The limitations are represented by the long duration due to the combination with ESD and endoscopic closure of the mucosal defect. It is also difficult to perform for lesions of the esophagogastric junction and pylorus. The main disadvantage of this technique is the size of the tumor. Since the lesion must be extracted orally, this approach is limited for gastric SMTs greater than 3 cm[5]. The indication

for NEWS is gastric SMTs and lymph node-negative EGC, where there is some technical contraindication to ESD.

The Japanese National Health Insurance Plan recently approved the LECS procedure for GC for insurance coverage. Postoperative gastrectomy syndrome and post-procedure physical weakness are negligible with LECS.

LECS was recently performed in an elderly patient who refused radical surgery as a palliative treatment[14].

Currently, the main indications for modified LECS are EGCs not amenable to endoscopic treatment by endoscopic mucosal resection (EMR)/ESD, again with negligible risk of LNM. The suspicion of LNM requires a gastrectomy with lymphadenectomy[15].

The combination of the NEWS technique with sentinel node (SN) navigation surgery for the treatment of EGCs was reported by Goto *et al*[10,16]. A previous prospective multicenter study had already validated SN navigation surgery for GC[17]. The combined use of modified LECS and SN navigation surgery in the case of EGC allows for oncologically adequate resections with minimally invasive approaches, and can represent a valid alternative in elderly patients. Currently, this combination technique can be applied to EGC in which SN (surgical nodal basin) dissection can be performed with intra-operative evaluation by the one-step nucleic acid amplification assay[8].

Moreover, as suggested by the authors, this new cooperative technique can be applied even to EGC, which has features that significantly increase the risk of bleeding and/or perforation. Careful selection of indications and careful post-operative follow-up is required. No cases of disseminated GC recurrence have been described after LECS[7,15,18,19]. Randomized clinical trials on long-term oncological outcomes are needed to better clarify the future indications of ESD and modified LECS with SN navigation surgery.

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## FOOTNOTES

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## REFERENCES

- 1 **Inokuchi Y**, Ishida A, Hayashi K, Kaneta Y, Watanabe H, Kano K, Furuta M, Takahashi K, Fujikawa H, Yamada T, Yamamoto K, Machida N, Ogata T, Oshima T, Maeda S. Feasibility of gastric endoscopic submucosal dissection in elderly patients aged  $\geq 80$  years. *World J Gastrointest Endosc* 2022; **14**: 49-62 [PMID: 35116099 DOI: 10.4253/wjge.v14.i1.49]
- 2 **Shim CN**, Lee SK. Endoscopic submucosal dissection for undifferentiated-type early gastric cancer: do we have enough data to support this? *World J Gastroenterol* 2014; **20**: 3938-3949 [PMID: 24744583 DOI: 10.3748/wjg.v20.i14.3938]
- 3 **Abe N**, Takeuchi H, Ooki A, Nagao G, Masaki T, Mori T, Sugiyama M. Recent developments in gastric endoscopic submucosal dissection: towards the era of endoscopic resection of layers deeper than the submucosa. *Dig Endosc* 2013; **25** Suppl 1: 64-70 [PMID: 23368096 DOI: 10.1111/j.1443-1661.2012.01387.x]
- 4 **Hiki N**, Yamamoto Y, Fukunaga T, Yamaguchi T, Nunobe S, Tokunaga M, Miki A, Ohyama S, Seto Y. Laparoscopic and endoscopic cooperative surgery for gastrointestinal stromal tumor dissection. *Surg Endosc* 2008; **22**: 1729-1735 [PMID: 18074180 DOI: 10.1007/s00464-007-9696-8]
- 5 **Min JS**, Seo KW, Jeong SH. Choice of LECS Procedure for Benign and Malignant Gastric Tumors. *J Gastric Cancer* 2021; **21**: 111-121 [PMID: 34234973 DOI: 10.5230/jgc.2021.21.e21]
- 6 **Hiki N**, Nunobe S, Matsuda T, Hirasawa T, Yamamoto Y, Yamaguchi T. Laparoscopic endoscopic cooperative surgery. *Dig Endosc* 2015; **27**: 197-204 [PMID: 25394216 DOI: 10.1111/den.12404]
- 7 **Nunobe S**, Hiki N, Gotoda T, Murao T, Haruma K, Matsumoto H, Hirai T, Tanimura S, Sano T, Yamaguchi T. Successful

- application of laparoscopic and endoscopic cooperative surgery (LECS) for a lateral-spreading mucosal gastric cancer. *Gastric Cancer* 2012; **15**: 338-342 [PMID: 22350555 DOI: 10.1007/s10120-012-0146-5]
- 8 **Kumagai K**, Yamamoto N, Miyashiro I, Tomita Y, Katai H, Kushima R, Tsuda H, Kitagawa Y, Takeuchi H, Mukai M, Mano M, Mochizuki H, Kato Y, Matsuura N, Sano T. Multicenter study evaluating the clinical performance of the OSNA assay for the molecular detection of lymph node metastases in gastric cancer patients. *Gastric Cancer* 2014; **17**: 273-280 [PMID: 23743877 DOI: 10.1007/s10120-013-0271-9]
  - 9 **Goto O**, Mitsui T, Fujishiro M, Wada I, Shimizu N, Seto Y, Koike K. New method of endoscopic full-thickness resection: a pilot study of non-exposed endoscopic wall-inversion surgery in an *ex vivo* porcine model. *Gastric Cancer* 2011; **14**: 183-187 [PMID: 21394421 DOI: 10.1007/s10120-011-0014-8]
  - 10 **Goto O**, Takeuchi H, Kawakubo H, Sasaki M, Matsuda T, Matsuda S, Kigasawa Y, Kadota Y, Fujimoto A, Ochiai Y, Horii J, Uraoka T, Kitagawa Y, Yahagi N. First case of non-exposed endoscopic wall-inversion surgery with sentinel node basin dissection for early gastric cancer. *Gastric Cancer* 2015; **18**: 434-439 [PMID: 25087058 DOI: 10.1007/s10120-014-0406-7]
  - 11 **Goto O**, Takeuchi H, Kawakubo H, Matsuda S, Kato F, Sasaki M, Fujimoto A, Ochiai Y, Horii J, Uraoka T, Kitagawa Y, Yahagi N. Feasibility of non-exposed endoscopic wall-inversion surgery with sentinel node basin dissection as a new surgical method for early gastric cancer: a porcine survival study. *Gastric Cancer* 2015; **18**: 440-445 [PMID: 24619187 DOI: 10.1007/s10120-014-0358-y]
  - 12 **Inoue H**, Ikeda H, Hosoya T, Yoshida A, Onimaru M, Suzuki M, Kudo SE. Endoscopic mucosal resection, endoscopic submucosal dissection, and beyond: full-layer resection for gastric cancer with nonexposure technique (CLEAN-NET). *Surg Oncol Clin N Am* 2012; **21**: 129-140 [PMID: 22098836 DOI: 10.1016/j.soc.2011.09.012]
  - 13 **Kikuchi S**, Nishizaki M, Kuroda S, Tanabe S, Noma K, Kagawa S, Shirakawa Y, Kato H, Okada H, Fujiwara T. Nonexposure laparoscopic and endoscopic cooperative surgery (closed laparoscopic and endoscopic cooperative surgery) for gastric submucosal tumor. *Gastric Cancer* 2017; **20**: 553-557 [PMID: 27599829 DOI: 10.1007/s10120-016-0641-1]
  - 14 **Washio M**, Hiki N, Hosoda K, Niihara M, Chuman M, Sakuraya M, Wada T, Harada H, Sato T, Tanaka K, Naitoh T, Kumamoto Y, Sangai T, Tanabe S, Yamashita K. Laparoscopic and endoscopic cooperative surgery for advanced gastric cancer as palliative surgery in elderly patients: a case report. *Surg Case Rep* 2021; **7**: 241 [PMID: 34779942 DOI: 10.1186/s40792-021-01325-1]
  - 15 **Hiki N**, Nunobe S. Laparoscopic endoscopic cooperative surgery (LECS) for the gastrointestinal tract: Updated indications. *Ann Gastroenterol Surg* 2019; **3**: 239-246 [PMID: 31131352 DOI: 10.1002/ags3.12238]
  - 16 **Goto O**, Takeuchi H, Kitagawa Y, Yahagi N. Hybrid surgery for early gastric cancer. *Transl Gastroenterol Hepatol* 2016; **1**: 26 [PMID: 28138593 DOI: 10.21037/tgh.2016.03.23]
  - 17 **Kitagawa Y**, Takeuchi H, Takagi Y, Natsugoe S, Terashima M, Murakami N, Fujimura T, Tsujimoto H, Hayashi H, Yoshimizu N, Takagane A, Mohri Y, Nabeshima K, Uenosono Y, Kinami S, Sakamoto J, Morita S, Aikou T, Miwa K, Kitajima M. Sentinel node mapping for gastric cancer: a prospective multicenter trial in Japan. *J Clin Oncol* 2013; **31**: 3704-3710 [PMID: 24019550 DOI: 10.1200/JCO.2013.50.3789]
  - 18 **Aoki M**, Tokioka S, Narabayashi K, Hakoda A, Inoue Y, Yorifuji N, Chino Y, Sato I, Egashira Y, Takeuchi T, Higuchi K. Laparoscopic and endoscopic cooperative surgery for intra-mucosal gastric carcinoma adjacent to the ulcer scars. *World J Surg Oncol* 2018; **16**: 53 [PMID: 29530096 DOI: 10.1186/s12957-018-1355-0]
  - 19 **Kinami S**, Funaki H, Fujita H, Nakano Y, Ueda N, Kosaka T. Local resection of the stomach for gastric cancer. *Surg Today* 2017; **47**: 651-659 [PMID: 27342746 DOI: 10.1007/s00595-016-1371-z]



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