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The Application of the Enhanced Recovery after Surgery Concept in the Perioperative Management of Early Gastric Cancer Patients Undergoing Endoscopic Submucosal Dissection

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Abstract

Objective: To explore the safety and effectiveness of the Enhanced Recovery After Surgery (ERAS) concept in perioperative nursing for early gastric cancer patients undergoing Endoscopic Submucosal Dissection (ESD). **Methods:** From August 2021 to December 2023, 178 patients with early gastric cancer treated with ESD at the First Affiliated Hospital of Yangtze University or Jingzhou Central Hospital were screened according to inclusion and exclusion criteria using a randomized grouping method. After excluding 51 patients, 127 patients were included (ERAS group: 62, Control group: 65). The ERAS group received perioperative care based on the ERAS concept, while the control group received conventional care. Hamilton Anxiety Rating Scale (HAMA) and Visual Analog Scale (VAS) were used to assess perioperative anxiety, pain, hunger, and thirst. Postoperative first flatus time, complications, length of hospital stay, patient satisfaction, and 30-day readmission rates were also evaluated. **Results:** No significant differences were found between the two groups in terms of postoperative fever, bleeding, perforation, and 30-day readmission rates. The ERAS group had significantly lower HAMA scores, VAS scores (pain, hunger, and thirst), first flatus time, incidence of postoperative nausea/vomiting and hypoglycemia/hypoglycemic reactions, and length of hospital stay compared to the control group, while patient satisfaction was higher in the ERAS group. **Conclusion:** The application of the ERAS concept in the perioperative care of early gastric cancer patients undergoing ESD is safe and feasible. It does not

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increase complications and can enhance the benefits of ESD in treating early gastric cancer.

Keywords

Enhanced Recovery after Surgery, Endoscopic Submucosal Dissection, Early Gastric Cancer, Perioperative Nursing

1. Introduction

Endoscopic Submucosal Dissection (ESD) for early gastric cancer has advantages such as minimal trauma, fewer complications, fast recovery, and low cost, with efficacy comparable to that of surgical resection [1]. It is the preferred treatment for early gastric cancer [2] [3]. However, ESD usually requires general anesthesia with endotracheal intubation, takes longer than routine endoscopic procedures, and carries high technical difficulty, which may lead to complications like aspiration pneumonia, bleeding, and perforation. Furthermore, factors such as patient age, psychological status, stress response, nutritional condition, and postoperative guidance strategies can affect recovery, while perioperative management for early gastric cancer undergoing ESD mostly relies on clinical experience.

Enhanced Recovery After Surgery (ERAS) refers to a series of evidence-based perioperative interventions aimed at reducing psychological and physiological stress responses, minimizing energy loss, improving organ function, reducing postoperative complications, and promoting early recovery [4]. After years of development, ERAS has been widely adopted across various multidisciplinary fields, including colorectal surgery, orthopedics, urology, neurosurgery, hepatobiliary surgery, and gynecology, yielding positive outcomes [5]-[8]. However, no clinical guidelines currently exist for applying ERAS in the perioperative management of early gastric cancer treated with ESD. Therefore, this study aims to evaluate the safety and effectiveness of the ERAS concept in perioperative nursing for early gastric cancer patients undergoing ESD.

2. Materials and Methods

2.1. General Information

From August 2021 to December 2023, 172 patients diagnosed with early gastric cancer and admitted to the Department of Gastroenterology at either the First Affiliated Hospital of Yangtze University or Jingzhou Central Hospital for ESD treatment were included in the study. Patients were randomly assigned to the ERAS group or the Control group using a computer-generated random number table. (**Figure 1**) Inclusion criteria: 1) Age ≥ 18 years; 2) Indications for ESD treatment for early gastric cancer [9]; 3) Informed consent obtained from the patient and family. Exclusion criteria: 1) Bleeding risk (e.g., use of antiplatelet or anticoagulant medications within the past week); 2) Intolerance to anesthesia or endoscopic

procedures; 3) Non-curative resection; 4) Diabetes mellitus; 5) Non-compliant patients; 6) Incomplete clinical data. All procedures were performed by experienced endoscopists with over 10 years of expertise in ESD, and the study was approved by the hospital's ethics committee (Ethics approval number: KY2023128).

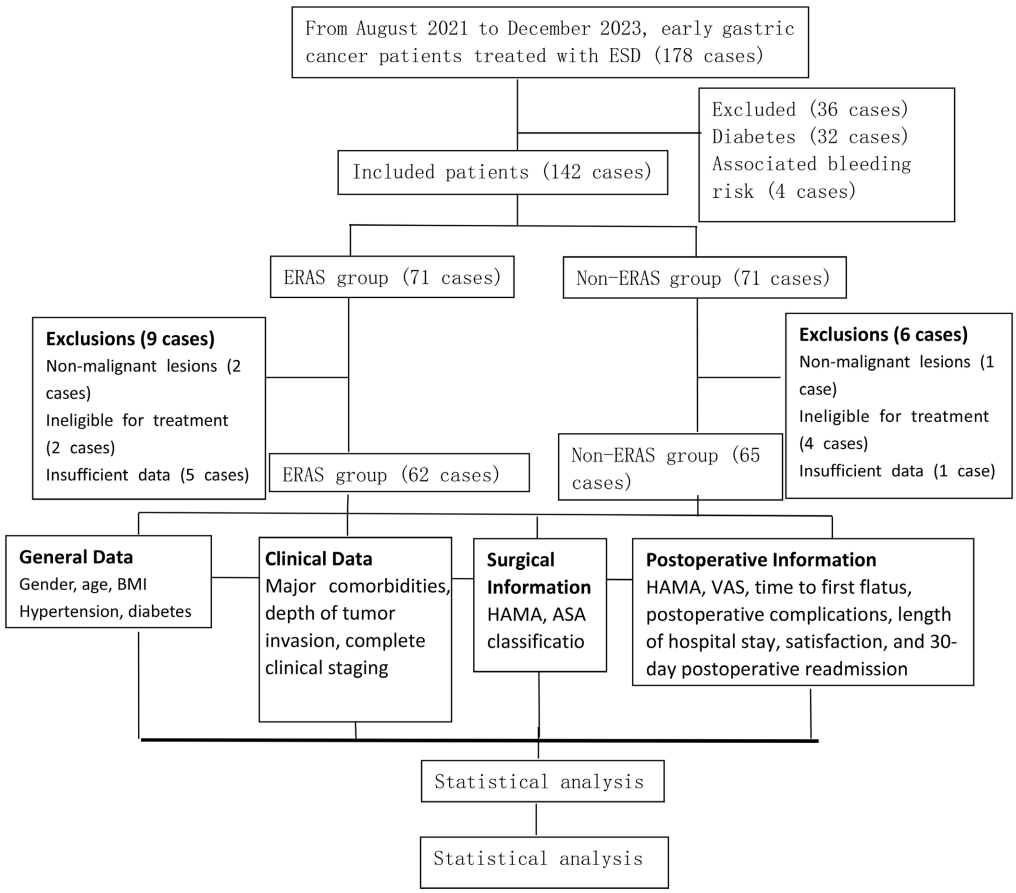

Figure 1. Technical roadmap.

2.2. Methods

(See **Table 1**)

Preoperative: In the ERAS group, patients and families were thoroughly informed about the condition, the necessity of surgery, and the detailed endoscopic treatment plan. Preoperative psychological counseling and education based on the ERAS concept were provided using video viewing and consultations. Nutritional risk screening was performed, and enteral or oral nutritional therapy was initiated for patients with significant nutritional risk. Six hours before surgery, patients consumed 800 mL of 12.5% carbohydrate solution, and 3 hours before surgery, 400 mL. The control group received routine preoperative education and fasting for 6 hours.

Intraoperative: Both groups underwent general anesthesia with endotracheal intubation. Intraoperative monitoring of body temperature, electrocardiogram, respiration, blood pressure, peripheral oxygen saturation, and end-expiratory carbon dioxide pressure was performed.

Postoperative: In the ERAS group, a basic acid suppression and gastric protection protocol was followed with a relatively limited fluid infusion to meet physiological needs. On the first postoperative day, patients were given a liquid diet and assisted with ambulation for 1 - 2 hours. On the second day, they were given a semi-liquid diet and gradually transitioned to a normal diet. The control group received routine fluid management and gastric protection, with a liquid diet starting on days 2 - 3 after surgery and ambulation based on patient preference.

Table 1. Perioperative nursing methods in ERAS and control groups.

Nursing Method	ERAS Group	Control Group
Preoperative	A detailed explanation of the condition, the necessity of surgery, and the ESD treatment plan. Preoperative psychological counseling using videos and consultations. Nutritional risk screening and enteral or oral nutritional support for high-risk patients. 800 mL of 12.5% carbohydrate solution 6 hours pre-surgery and 400 mL 3 hours before surgery.	Routine education. Fasting for 6 hours pre-surgery.
Intraoperative	General anesthesia with intubation, necessary intraoperative warming measures, and routine monitoring of vital signs.	Same as the ERAS group.
Postoperative	Acid suppression and gastric protection with limited fluid infusion. Liquid diet on day 1, ambulation for 1 - 2 hours, semi-liquid diet on day 2, transitioning to normal diet.	Routine fluid management, liquid diet from days 2 - 3, and ambulation are per patient preference.

2.3. Observational Indicators

Psychological Health: Anxiety was assessed pre- and post-operatively using the Hamilton Anxiety Rating Scale (HAMA).

Perioperative Pain, Hunger, and Thirst: Evaluated using the Visual Analog Scale (VAS), measuring pain, hunger, and thirst at 2 hours and 24 hours postoperatively.

Postoperative Indicators: Time to first postoperative flatus, complications (nausea/vomiting, hypoglycemia, bleeding, perforation, fever), length of hospital stay, patient satisfaction (0 - 10 scale), and 30-day readmission rate.

2.4. Statistical Methods

Data were entered and processed using Excel 2019 and analyzed using SPSS 26.0. Categorical variables were expressed as numbers and percentages, and intergroup comparisons were made using chi-square tests or Fisher's exact tests. Continuous variables were expressed as means ± standard deviations (± SD), medians, and ranges and compared using independent t-tests or rank-sum tests. A p-value of < 0.05 was considered statistically significant.

3. Results

Clinical Characteristics Comparison

A total of 178 patients were evaluated for eligibility, with 51 excluded (32 with diabetes, 4 with bleeding risks, 3 requiring surgical resection, 6 non-compliant, and 6 with incomplete clinical data), leaving 127 patients included (62 in the ERAS group

and 65 in the Control group). No significant differences were found between the two groups in terms of baseline age, sex, BMI, comorbidities (hypertension, diabetes), ASA classification, operative time, specimen size, invasion depth, or pathological grade ($p > 0.05$). (Table 2, Table 3)

Table 2. Comparison of clinical characteristics between ERAS and control groups.

Variable	ERAS Group (n = 62)	Control Group (n = 65)	$t/x^2/U$	P-value
Age (Years)	53.80 ± 10.81	54.74 ± 11.67	0.138	0.972
Gender (Male/Female)	28/34	31/34	0.082	0.775
BMI (kg/m^2)	22.31 ± 2.21	22.89 ± 2.57	3.314	0.814
Hypertension (%)	13 (20.97%)	15 (23.08%)	0.082	0.774
Coronary Heart Disease (%)	7 (11.29%)	9 (13.85%)	0.188	0.664
Specimen Size (cm)	4.16 ± 1.53	4.22 ± 1.39	2.576	0.866
Depth			0.939	0.333
Mucosal Layer	56	55		
Superficial Submucosal Layer	6	10		
Pathological Classification				
High-grade Epithelial Neoplasia (%)	34	38	0.170	0.680
Low-grade Epithelial Neoplasia (%)	15	12	0.623	0.430
Differentiation	12	13	0.008	0.927
Undifferentiated	1	2	0.000	1.000
Complete Resection (%)	57	58	0.271	0.602
ASA Classification				
Class I	40	39	0.275	0.600
Class II	17	20	0.172	0.678
Class III	5	6	0.055	0.815
Surgical Operation Time (min)	40.78 ± 10.11	42.05 ± 11.27	2.179	0.619

ASA: American Society of Anesthesiologists.

Table 3. Comparison of observational indicators between ERAS and control groups.

Observation Indicator	ERAS Group (n = 62)	Control Group (n = 65)	$t/x^2/U$	P-value
Preoperative HAMA Score (points)	14.47 ± 6.76	20.31 ± 8.83	3.340	<0.001
Postoperative HAMA Score (points)	9.30 ± 4.41	12.27 ± 4.54	2.480	0.016
Postoperative First Flatus Time (hrs)	13.37 ± 6.81	17.53 ± 6.91	0.217	0.034
Preoperative VAS Score (median points)				
Hunger	2 (0, 6)	4 (0, 8)	0.387	<0.001
Thirst	2 (0, 7)	3 (0, 9)	1.235	<0.001
Postoperative 2-hour VAS Score (median)				
Pain	3 (0, 5)	3 (0, 6)	0.145	0.853
Hunger	4 (0, 7)	6 (0, 8)	1.676	<0.001
Thirst	3 (0, 6)	5 (0, 8)	2.455	<0.001

Continued

Postoperative 24-hour VAS Score (median)				
Pain	3 (0, 5)	4 (0, 7)	0.359	0.033
Hunger	3 (0, 8)	7 (1, 9)	0.341	<0.001
Thirst	4 (1, 8)	7 (1, 9)	2.237	<0.001
Postoperative Complications (cases)				
Nausea/Vomiting	8	18	4.456	0.035
Hypoglycemia/Low Blood Sugar Reactions	6	17	4.293	0.038
Fever	3	5	0.102	0.750
Bleeding	1	2	0.000	1.000
Perforation	0	0	—	—
Others	0	1	0.000	1.000
Postoperative Hospital Stay (median days)	3 (2, 7)	4 (3, 9)	2.691	<0.001
Satisfaction (median points)	9 (3, 10)	7 (2, 10)	3.915	<0.001
30-day Readmission Rate (%)	0 (0)	2 (3.08)	0.461	0.497

HAMA: Hamilton Anxiety Rating Scale; **VAS**: Visual Analogue Scale.

4. Discussion

The results of this study demonstrate that the ERAS concept in the perioperative care of early gastric cancer patients undergoing ESD can effectively reduce anxiety and improve patient satisfaction while not increasing postoperative complications. Specifically, the ERAS group showed significantly reduced anxiety (as measured by HAMA scores), better control of hunger and thirst (as indicated by VAS scores), and shorter hospital stays compared to the control group.

Traditional preoperative fasting requirements (12 hours for food and 6 hours for liquids) have been shown to not necessarily reduce postoperative complications and could potentially cause insulin resistance and postoperative discomfort [10] [11]. This study confirmed that using carbohydrate drinks prior to surgery (800 mL 6 hours before and 400 mL 3 hours before) reduced discomfort and hunger, aligning with previous research [12]-[14].

The study also highlights the importance of early oral intake and early ambulation after gastric cancer surgery, which has been proven to promote early recovery of gastrointestinal function, reduce infection rates, and shorten hospital stays [15]-[17]. Importantly, early post-ESD intake of liquids and assisted early ambulation in the ERAS group reduced nausea, vomiting, hypoglycemic reactions, and first flatus time while also promoting quicker recovery.

In conclusion, the use of the ERAS concept in perioperative care for early gastric cancer patients undergoing ESD is safe and feasible, enhancing the benefits of ESD without adding complications. While acknowledging that a 30-day follow-up period may be relatively short, it would be valuable for future studies to include longer-term follow-up to assess the sustained impact of the ERAS intervention on

outcomes such as recurrence and quality of life. Additionally, larger sample sizes are needed in future studies to confirm these findings and further explore the long-term effects of ERAS on patient outcomes.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Meng, F., Zhang, Z., Wang, Y., Lu, L., Zhu, J. and Ji, F. (2015) Comparison of Endoscopic Resection and Gastrectomy for the Treatment of Early Gastric Cancer: A Meta-Analysis. *Surgical Endoscopy*, **30**, 3673-3683. https://doi.org/10.1007/s00464-015-4681-0

[2] Japanese Gastric Cancer Association (2016) Japanese Gastric Cancer Treatment Guidelines 2014 (ver. 4). *Gastric Cancer*, **20**, 1-19. https://doi.org/10.1007/s10120-016-0622-4

[3] Ono, H., Yao, K., Fujishiro, M., Oda, I., Nimura, S., Yahagi, N., *et al.* (2015) Guidelines for Endoscopic Submucosal Dissection and Endoscopic Mucosal Resection for Early Gastric Cancer. *Digestive Endoscopy*, **28**, 3-15. https://doi.org/10.1111/den.12518

[4] Kehlet, H. and Wilmore, D.W. (2002) Multimodal Strategies to Improve Surgical Outcome. *The American Journal of Surgery*, **183**, 630-641. https://doi.org/10.1016/s0002-9610(02)00866-8

[5] Huang, M.L., Mo, Y.X., Zhong, S.B., *et al.* (2024) Application of the Enhanced Recovery after Surgery (ERAS) Concept in Perioperative Care of Liver Surgery Patients based on the Xiaos' Double-C Nursing Model. *International Journal of Nursing*, **43**, 634-638.

[6] Fang, H.P., Li, R.R., Cai, C., *et al.* (2019) Construction and Application of the Enhanced Recovery after Surgery Nursing Professional Team Management Model. *Nursing Journal*, **34**, 5-8.

[7] Qiu, J.X., Ma, L.L., Hong, R.H., *et al.* (2022) Analysis of the Correlation between Discharge Preparation and Nutritional Status in Gastric Cancer Patients after Surgery under the ERAS Model. *Chinese Journal of Modern Nursing*, **28**, 2051-2056.

[8] Wang, M.G., Lu, J., Yin, R.L., *et al.* (2023) Scope Review of Early Activity Implementation in Postoperative Colorectal Cancer Patients under ERAS Nursing. *Nursing Journal*, **38**, 22-26.

[9] National Clinical Medicine Research Center for Digestive Diseases, Chinese Society of Digestive Endoscopy and China Medical Association Digestive Physicians Branch (2018) Perioperative Guidelines for Endoscopic Submucosal Dissection for Gastric Cancer. *Chinese Journal of Internal Medicine*, **57**, 13-26.

[10] Smith, I., Kranke, P., Murat, I., Smith, A., O'Sullivan, G., Sreide, E., *et al.* (2011) Perioperative Fasting in Adults and Children. *European Journal of Anaesthesiology*, **28**, 556-569. https://doi.org/10.1097/eja.0b013e3283495ba1

[11] Chinese Society of Surgery and Chinese Society of Anesthesiology (2018) Chinese Expert Consensus and Pathway Management Guidelines for Enhanced Recovery after Surgery. *Chinese Journal of Anesthesiology*, **38**, 8-13.

[12] Tanaka, R., Lee, S., Kawai, M., Tashiro, K., Kawashima, S., Kagota, S., *et al.* (2017) Protocol for Enhanced Recovery after Surgery Improves Short-Term Outcomes for

Patients with Gastric Cancer: A Randomized Clinical Trial. *Gastric Cancer*, **20**, 861-871. https://doi.org/10.1007/s10120-016-0686-1

[13] Sun, Y., Tian, Y., Cao, S., Li, L., Yu, W., Ding, Y., *et al.* (2023) Multimodal Prehabilitation to Improve the Clinical Outcomes of Frail Elderly Patients with Gastric Cancer: A Study Protocol for a Multicentre Randomised Controlled Trial (GISSG + 2201). *BMJ Open*, **13**, e071714. https://doi.org/10.1136/bmjopen-2023-071714

[14] Tian, Y., Cao, S., Li, L., He, Q., Xia, L., Jiang, L., *et al.* (2020) Effects of Perioperative Enhanced Recovery after Surgery Pathway Management versus Traditional Management on the Clinical Outcomes of Laparoscopic-Assisted Radical Resection of Distal Gastric Cancer: Study Protocol for a Randomized Controlled Trial. *Trials*, **21**, Article No. 369. https://doi.org/10.1186/s13063-020-04272-8

[15] Tweed, T., van Eijden, Y., Tegels, J., Brenkman, H., Ruurda, J., van Hillegersberg, R., *et al.* (2019) Safety and Efficacy of Early Oral Feeding for Enhanced Recovery Following Gastrectomy for Gastric Cancer: A Systematic Review. *Surgical Oncology*, **28**, 88-95. https://doi.org/10.1016/j.suronc.2018.11.017

[16] Wang, J., Yang, M., Wang, Q. and Ji, G. (2019) Comparison of Early Oral Feeding with Traditional Oral Feeding after Total Gastrectomy for Gastric Cancer: A Propensity Score Matching Analysis. *Frontiers in Oncology*, **9**, Article 1194. https://doi.org/10.3389/fonc.2019.01194

[17] Hogan, S., Steffens, D., Rangan, A., Solomon, M. and Carey, S. (2019) The Effect of Diets Delivered into the Gastrointestinal Tract on Gut Motility after Colorectal Surgery—A Systematic Review and Meta-Analysis of Randomised Controlled Trials. *European Journal of Clinical Nutrition*, **73**, 1331-1342. https://doi.org/10.1038/s41430-019-0474-1