Post-gastrectomy spleen enlargement and esophageal varices: Distal vs total gastrectomy

Takatsugu Oida, Kenji Mimatsu, Hisao Kano, Atsushi Kawasaki, Youichi Kuboi, Nobutada Fukino, Sadao Amano

Takatsugu Oida, Kenji Mimatsu, Hisao Kano, Atsushi Kawasaki, Youichi Kuboi, Nobutada Fukino, Department of Surgery, Social Insurance Yokohama Central Hospital, 268 Yamashita-cho, Naka-ku, Yokohama 231-8553, Japan
Sadao Amano, Department of Surgery, Nihon University School of Medicine, 30-1 Oyaguchi, kami-cho, Itabashi-ku, Tokyo 173-0023, Japan

Author contributions: Oida T, Mimatsu K, Kano H, Kawasaki A, Kuboi Y and Fukino N carried out the operation and were consultants overseeing the patient’s care; Oida T wrote the manuscript; Amano S drafted the manuscript and revised it critically.

Correspondence to: Takatsugu Oida, MD, PhD, Department of Surgery, Social Insurance Yokohama Central Hospital, 268 Yamashita-cho, Naka-ku, Yokohama 231-8553, Japan. ooida.takatsugu@yokochu.jp
Telephone: +81-45-6411921 Fax: +81-45-6719871
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Abstract

AIM: To study the relationship between platelet count-to-spleen diameter ratio and post-gastrectomy esophageal varices (EVs) development in patients without liver cirrhosis or hepatitis.

METHODS: We retrospectively studied 92 patients who underwent gastrectomy. They were divided into 2 groups on the basis of the surgical treatment: the distal gastrectomy (DG) group and total gastrectomy (TG) group. The incidence of EVs was determined and postoperative platelet counts, spleen diameters, and platelet count-to-spleen diameter ratios were compared between the 2 groups.

RESULTS: EVs were not detected during the first 6 mo after surgery in either group; however, at 12 mo after surgery, EVs were detected in 2 patients (3%) in the DG group and in 1 patient (3.6%) in the TG group; their mean platelet count-to-spleen diameter ratio was 2628 ± 409, and 2604 ± 360, respectively.

CONCLUSION: Endoscopy should be performed to detect EVs when the platelet count-to-spleen diameter ratio is < 2600.

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Key words: Spleen enlargement; Esophageal varices; Platelet count; Distal gastrectomy; Total gastrectomy

Peer reviewers: Marco Giuseppe Patti, MD, Professor, Director, Center for Esophageal Diseases, University of Chicago Pritzker School of Medicine, 5841 S. Maryland Avenue, MC 5095, Room G 201, Chicago, IL 60637, United States; Piero Marco Fisichella, MD, Assistant Professor, Medical Director, Swallowing Center, Loyola University Medical Center, Department of Surgery, Stritch School of Medicine, 2160 South First Avenue, Room 3226, Maywood, IL 60153, United States

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INTRODUCTION

Esophageal varices (EVs) are one of the major life-threatening complications of liver cirrhosis[1], and its prevalence is approximately 40% at the time of diagnosis, and 60% in those with decompensated disease[2-3]. When EVs rupture, the mortality rate ranges from 17% to 57%[4-7]. Therefore, screening of all patients diagnosed with liver cirrhosis for the presence of EVs is recommended[8,9]. Giannini et al[10] performed a study to identify parameters that could aid noninvasive prediction of EVs, and reported that the platelet count-to-spleen diameter ratio was the best noninvasive predictor of EVs. However, spleen enlargement is frequently observed during follow-up of noncirrhotic patients who have
undergone gastrectomy, and, in addition, some of these patients developed EVs. Thus, we studied the relationship between the platelet count-to-spleen diameter ratio and the development of EVs, and compared distal and total gastrectomy (TG) with regard to these variables in patients without liver cirrhosis or hepatitis.

MATERIALS AND METHODS

Patients
We retrospectively studied 92 patients (66 men and 26 women; age range, 30-80 years; mean age, 68 ± 10 years) who underwent gastrectomy between May 2002 and April 2006 at the Department of Surgery, Social Insurance Yokohama Central Hospital, Yokohama, Japan. The following patients were excluded from our study: those who had undergone abdominal operation in the past, those with hepatitis, and those in whom disease recurrence was observed. Preoperative upper gastrointestinal endoscopy was performed in all the patients; further, EVs were not confirmed in any of the patients. These patients were divided into the following 2 groups on the basis of the surgical treatment they received: patients who underwent distal gastrectomy (DG), and patients who underwent TG. The maximum bipolar diameter of the spleen was measured by ultrasound scanning. The platelet count, spleen diameter, and platelet count-to-spleen diameter ratio were measured after surgery, and their relationship with the occurrence of EVs was studied.

Endoscopic classification of esophageal varices
On the basis of the endoscopic findings, the EVs were classified into 3 grades: grade 1, varices could be compressed with the endoscope; grade 2, varices could not be compressed with the endoscope; and grade 3, varices were confluent around the esophagus.\(^1\)

Statistical analysis
Univariate analysis was performed using the Student’s t-test for continuous variables and Fisher’s exact test and the \(\chi^2\) test for categorical variables. A P-value of less than 0.05 was considered to be significant.

RESULTS

Table 1 shows the patient characteristics and preoperative variables. No differences were observed between the 2 groups with respect to mean age, sex ratio, and preoperative clinical data. The gastric cancers were staged according to the Japanese Classification of Gastric Carcinoma,\(^2\) and their stages were found to be similar.

Table 2 shows the variables 3 mo after the operation. The mean platelet count, mean spleen diameter, and mean platelet count-to-spleen diameter ratio were 25.8 ± 10³ × 10⁴/μL, 93.9 ± 7.6 mm, and 2769 ± 453, respectively, in the DG group, and 25.1 × 10⁴ ± 3.9 × 10⁴/μL, 96.8 ± 9.5 mm, and 2593 ± 328, respectively, in the TG group. No differences were observed between the 2 groups, and no EVs developed in either group.

Table 3 shows the variables 6 mo after the operation. The mean platelet count, mean spleen diameter, and mean platelet count-to-spleen diameter ratio in the DG group were 26.7 ± 10³ × 4.3 × 10⁴/μL, 95.6 ± 7.6 mm, 2853 ± 458, respectively, and in the TG group, 26.5 × 10³ ± 3.9 × 10⁴/μL, 100.6 ± 9.4 mm, and 2632 ± 373, respectively. There was no significant difference between the 2 groups with respect to the platelet count; however, the mean spleen diameter in the TG group was significantly greater than that in the DG group (P < 0.0078), and the mean platelet count-to-spleen diameter ratio in the TG group was significantly lower than that in the DG group (P < 0.0274). No EVs developed in the patients in either group.
Table 3  Clinical data 6 mo postoperatively a (%), (mean ± SD)  

|                      | DG group (n = 64) | TG group (n = 28) | P-value |
|----------------------|-------------------|-------------------|---------|
| Platelet count (× 10^12/μL) | 26.7 ± 4.3 | 26.5 ± 3.9 | 0.8016 |
| Spleen diameter (mm)   | 95.6 ± 7.6      | 100.6 ± 9.4      | 0.0078 |
| Platelet count/spleen diameter ratio | 2853 ± 458 | 2632 ± 373 | 0.0274 |
| Esophageal varices     |                   |                   |         |
| Grade 1               | 0 (0)            | 0 (0)            | 1.00    |
| Grade 2               | 0 (0)            | 0 (0)            | 1.00    |
| Grade 3               | 0 (0)            | 0 (0)            | 1.00    |
| Total occurrence rate | 0 (0)            | 0 (0)            | 1.00    |

Table 4  Clinical data 12 mo postoperatively a (%), (mean ± SD)  

|                      | DG group (n = 64) | TG group (n = 28) | P-value |
|----------------------|-------------------|-------------------|---------|
| Platelet count (× 10^12/μL) | 26.8 ± 3.9 | 27.5 ± 3.7 | 0.4358 |
| Spleen diameter (mm)   | 102.4 ± 8.7      | 105.9 ± 9.0      | 0.0843 |
| Platelet count/spleen diameter ratio | 2626 ± 409 | 2604 ± 360 | 0.7887 |
| Esophageal varices     |                   |                   |         |
| Grade 1               | 2 (3)            | 1 (3.6)          | 1.00    |
| Grade 2               | 0 (0)            | 0 (0)            | 1.00    |
| Grade 3               | 0 (0)            | 0 (0)            | 1.00    |
| Total occurrence rate | 2 (3)            | 1 (3.6)          | 1.00    |

Table 5  Clinical data 24 mo postoperatively a (%), (mean ± SD)  

|                      | DG group (n = 64) | TG group (n = 28) | P-value |
|----------------------|-------------------|-------------------|---------|
| Platelet count (× 10^12/μL) | 26.4 ± 3.7 | 25.8 ± 4.0 | 0.4533 |
| Spleen diameter (mm)   | 104.4 ± 9.8      | 109.9 ± 10.1     | 0.0164 |
| Platelet count/spleen diameter ratio | 2546 ± 380 | 2357 ± 365 | 0.00287 |
| Esophageal varices     |                   |                   |         |
| Grade 1               | 2 (3)            | 2 (7.1)          | 0.5825 |
| Grade 2               | 0 (0)            | 1 (3.6)          | 0.3043 |
| Grade 3               | 0 (0)            | 0 (0)            | 1.00    |
| Total occurrence rate | 2 (3)            | 3 (10.7)         | 0.1629 |

Table 6  Clinical data 36 mo postoperatively a (%), (mean ± SD)  

|                      | DG group (n = 64) | TG group (n = 28) | P-value |
|----------------------|-------------------|-------------------|---------|
| Platelet count (× 10^12/μL) | 26.3 ± 3.8 | 25.9 ± 4.3 | 0.3904 |
| Spleen diameter (mm)   | 105.6 ± 9.8      | 110.6 ± 9.6      | 0.0147 |
| Platelet count/spleen diameter ratio | 2515 ± 386 | 2317 ± 381 | 0.0256 |
| Esophageal varices     |                   |                   |         |
| Grade 1               | 3 (4.7)          | 3 (10.7)         | 0.3638 |
| Grade 2               | 1 (1.6)          | 1 (3.6)          | 0.5184 |
| Grade 3               | 0 (0)            | 0 (0)            | 1.00    |
| Total occurrence rate | 4 (6.3)          | 4 (14.3)         | 0.2082 |

Bleeding from ruptured EVs is the leading cause of death among patients with liver cirrhosis[1], and the mortality rate from this complication varies between 17% and 57%[2-7]. Thus, cirrhotic patients should be screened for the presence of EVs. Some authors suggested that repeated endoscopy at intervals of 2-3 years should be performed in patients without varices, and that it should be performed at intervals of 2 years in patients with small varices in order to evaluate the development or progression of EVs[8-10]. However, in order to develop less invasive and cost-effective screening procedures for EVs, several studies have attempted to validate parameters that could be used for noninvasive screening[10-12]. This study attempts to declare that platelet count and spleen diameter have a good correlation with the presence of EVs. In addition, Giannini et al[10] and Baig et al[12] reported that
the platelet count-to-spleen diameter ratio has the highest accuracy for noninvasive prediction of EVs in cirrhotic patients. However, spleen enlargement is frequently observed after patients have undergone gastrectomy. Thus, we studied the relationship between the platelet count-to-spleen diameter ratio and the presence of EVs after gastrectomy, and compared distal and TG with regard to these parameters in patients without liver cirrhosis or hepatitis. In addition, in order to avoid surgical influence, patients who had undergone abdominal operation in the past were excluded from this study. All our patients were healthy and did not exhibit any recurrence during their follow-up. In patients who did not have liver cirrhosis or hepatitis, the occurrence rate of EVs was thought to be low; however, splenic arterial flow was thought to increase after but not before the surgery. In general, blood flow in the celiac artery (CA) is diverted into 3 arteries: the common hepatic artery (CHA), left gastric artery (LGA), and splenic artery (SA). During gastrectomy (distal and total), the LGA and left gastric vein are ligated and cut, and blood flow from the CA is diverted into 2 arteries - the CHA and SA. Thus, blood flow in the CHA and SA increases after surgery. Moreover, during lymph node dissection around the celiac axis, collateral veins from the splenic vein are ligated and cut; thus, in our patients, blood outflow from the spleen was thought to decrease after the surgery as compared to that before the surgery. Also, in the TG group, short gastric veins were ligated and cut, and blood outflow from the spleen was thought to be lower than that in the GD group patients. This may be one of the main reasons why spleen enlargement was greater in the TG group than in the DG group.

Giannini et al. reported that the prevalence-adjusted positive and negative predictive values for a platelet count-to-spleen diameter ratio of 909 were 96% and 100%, respectively, and Baig et al. reported that the prevalence-adjusted positive and negative predictive values for a platelet count-to-spleen diameter ratio of 1014 were 9.4% and 95.1%, respectively. In our study, grade 1 EVs were detected in 2 patients (3%) in the DG group, and in 1 patient (3.6%) in the TG group at 12 mo after surgery, and the mean platelet count-to-spleen diameter ratio of the patients was found to be 2628 ± 409 in the DG group, and 2604 ± 360 in the TG group. At 24 mo after surgery, grade 2 EVs were detected in 1 patient (3.6%) in the TG group, and the mean platelet count-to-spleen diameter ratio of these patients was found to be 2357 ± 365. In the DG group, grade 2 EVs were detected 36 mo after the surgery, and the mean platelet count-to-spleen diameter ratio of the patients was found to be 2515 ± 386. In our study, EVs developed in 4 patients each in the DG group (6.3%) and the TG group (14.3%) after the surgery; however, no patient exhibited grade 3 EVs. In addition, none of our patients had liver cirrhosis or hepatitis; this contributed to the higher platelet count-to-spleen diameter ratio than that reported by Giannini et al. and Baig et al. To the best of our knowledge, studies on the relationship between the platelet count-to-spleen diameter ratio and the presence of EVs have not been conducted in patients who underwent gastrectomy. Thus, on the basis of the results of our study, we suggest that the occurrence rate of EVs may increase after 6 mo post DG and when the platelet count-to-spleen diameter ratio is less than 2600. Thus, in the case of patients who have undergone gastrectomy for gastric cancer, the development of EVs after surgery is a strong possibility.

In conclusion, spleen enlargement after gastrectomy is greater in the case of TG than DG, and the platelet count-to-spleen diameter ratio is a useful parameter for the noninvasive prediction of EVs after gastrectomy. In addition, we think that the occurrence rate of EVs increases after 6 mo post gastrectomy, and therefore, when the platelet count-to-spleen diameter ratio is less than 2600, endoscopy should be performed to determine the presence of EVs.

COMMENTS

Background

Esophageal varices (EVs) are one of the major life-threatening complications of liver cirrhosis, and its prevalence rate is approximately 40% at the time of diagnosis, and 60% in those with decompensated disease. Therefore, screening of all patients diagnosed with liver cirrhosis for the presence of EVs is recommended.

Research frontiers

Spleen enlargement is frequently observed during follow-up of noncirrhotic patients who have undergone gastrectomy. The authors studied the relationship between the platelet count-to-spleen diameter ratio and the development of EVs, and compared distal and total gastrectomy (TG) with regard to these variables in patients without liver cirrhosis or hepatitis.

Innovations and breakthroughs

The authors retrospectively studied 92 patients who underwent gastrectomy. They were divided into 2 groups on the basis of the surgical treatment: the distal gastrectomy (DG) group and TG group. The incidence of esophageal varices was determined and postoperative platelet counts, spleen diameters, and platelet count-to-spleen diameter ratios were compared between the 2 groups.

Applications

Spleen enlargement after gastrectomy is greater in the case of TG than DG, and the platelet count-to-spleen diameter ratio is a useful parameter for the noninvasive prediction of EVs after gastrectomy.

Peer review

It is an interesting manuscript, though the background did not identify the real reason why the authors were embarking on their endeavor. The results were well presented and the discussion would be improved. It is a nice experiment.

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