Predictive factors of endoscopic submucosal dissection procedure time for early esophageal cancer

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To the Editor: Endoscopic submucosal dissection (ESD) has developed into an advanced technique extensively used in the treatment of early esophageal cancer. However, the disadvantages of ESD are its technical difficulty and it is linked to a high incidence of complications, the demand for sophisticated endoscopic techniques, and a lengthy procedure time. Studies have confirmed that ESD time is closely correlated with perforation, bleeding, and deep vein thrombosis, post-operative pneumonia, CO₂ retention, or increased medical costs.[1-4]

The time required for ESD operation is one of the best indexes to measure the difficulty of ESD operation. If the difficulty of operation can be assessed, then the program time can be predicted. It will be supremely useful to schedule surgery to reduce ESD time and prevent possible complications. We present a total of 197 patients with 201 early esophageal cancer cases. Data were collected, and the determinants of ESD time were analyzed.

ESD time was defined as the time from peripheral labeling to complete resection of early esophageal cancer. Under endoscopy, the degree of submucosal fibrosis was classified according to the observation of the injection of glycerol mixture. Fibrosis was defined as a whitish muscle-like structure in the submucosal layers during ESD.

Pearson correlation coefficient was used for the preliminary univariate analysis. A multiple logistic regression analysis was used to determine independent predictors of procedure time. SPSS software, version 18.0, (SPSS Inc, Chicago, IL, USA) was used for data processing.

In this study, all ESD procedures were performed by endoscopists with >15 years of experience using the same equipment. The maximum diameter of the resected lesions was 3.0 cm (0.8–8.5 cm). The median procedure time was 66.9 min (10–190 min). The univariate analysis of procedural time variables is shown in Table 1. The macroscopic type, tumor size, the proportion of circumferential extension, adhesion, and perforation during the procedure had a significant impact on the procedural time. Multiple linear regression analysis revealed that ESD time was positively correlated with macroscopic type, tumor size, proportion, adhesion, and perforation during the procedure [Supplementary Table 1, http://links.lww.com/CM9/A451]. The multivariate logistic regression analysis using these variables showed that the presence of adhesion, the proportion of circumferential extension of >1/2, and tumor size >2 cm were independent factors with a significant difference [Supplementary Table 2, http://links.lww.com/CM9/A451]. More than 66.9 min of procedural time was considered a long amount of time.

The ESD procedures in the present study, which were performed by the same operator using the same equipment, were identical among different patients. Therefore, the influence of procedural differences on ESD time was excluded. However, as far as we all know, no investigation of ESD procedure time has been performed in a large group of patients with early esophageal cancer. Our multivariate analysis showed that adhesion, tumor size, and the proportion of circumferential extension were significant predictors of procedure time. Our results showed that the existence of adhesion, the proportion of circumferential extension of >1/2, and tumor size >2 cm were independent factors affecting ESD time. In previous studies, submucosal fibrosis was an independent predictor of a longer ESD time. [5-6] Our research likewise draws the corresponding conclusion. Fibrotic adhesion under the mucosa will evidently lead to the difficulty of submucosal dissection, consequently prolonging the operation time.
Longer procedure times have been involved in increased risks of complications.\textsuperscript{7,8} Therefore, reducing ESD procedure time can decrease the occurrence of complications during and after ESD operation. The prediction of procedural time is a matter of great concern for both patients and operators. First, if the ESD time is expected to be long, we can arrange senior experts to complete the operation, so as to shorten the operation time. Second, depending on the length of the operation time, the anesthesiologist can use different methods. Finally, the prediction of ESD time is helpful for operators to take appropriate measures to prevent ESD complications such as aspiration during operation, venous thrombosis, or post-operative pneumonia.

There are a few limitations to our research. First, this study was based on a single-center analysis with small sample size. As a result, possible bias could not be eliminated. Second, we did not have a strict, standardized description of the severity of bleeding during the procedure. Therefore, the impact of bleeding during the procedure could not be analyzed.

All in all, our results revealed that large tumor size, presence of tumor in more than one-half of the circumference of the esophagus, perforation, and adhesion predict a long ESD time. The results of this study may provide some references for making a reasonable operation schedule.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s)/patient’s guardians has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the article. The patients/patient’s guardians understand that their names and initials will not be published and due efforts will be made to conceal the identity of the patient, although anonymity cannot be guaranteed.

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**Conflicts of interest**

None.

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**Table 1: Categorical variables and endoscopic submucosal dissection time.**

| Predictive factors                          | n  | Mean ± SD  | Median (IQR) | P     |
|---------------------------------------------|----|------------|--------------|-------|
| Total patients                              | 201| 66.9 ± 39.5| 60.0 (10.0–190.0) | 0.970 |
| Age (years)                                 |    | 70.0 ± 8.7 | 61.0 (30.0–83.0)  | 0.640 |
| Sex                                          |    |            |              |       |
| Male                                         | 142| 62.8 ± 38.1| 56.0 (10.0–180.0) |       |
| Female                                       | 59 | 76.8 ± 41.2| 68.0 (17.0–190.0) |       |
| Location                                    |    |            |              |       |
| Upper esophagus                             | 6  | 58.7 ± 34.7| 44.0 (30.0–110.0) | 0.490 |
| Middle esophagus                            | 137| 65.2 ± 39.1| 59.0 (10.0–190.0) |       |
| Lower esophagus                             | 58 | 71.2 ± 41.0| 61.0 (12.0–175.0) |       |
| Macroscopic type                            |    |            |              |       |
| 0-I/IIa                                     | 18 | 50.4 ± 35.7| 32.0 (16.0–143.0) | 0.001 |
| 0-IIb/IIc                                   | 174| 66.3 ± 37.2| 60.0 (10.0–180.0) |       |
| Combined                                    | 9  | 111.7 ± 59.1| 112.0 (49.0–190.0)|       |
| Tumor size                                  |    |            |              |       |
| ≤2.0 cm                                     | 63 | 41.0 ± 26.7| 33.0 (10.0–184.0) | <0.001|
| 2.0–4.0 cm                                  | 102| 64.9 ± 27.5| 62.0 (16.0–169.0) |       |
| ≥4.0 cm                                     | 36 | 118.1 ± 39.3| 112.0 (10.0–190.0)|       |
| The proportion of circumferential extension |    |            |              |       |
| <1/2                                        | 125| 50.1 ± 27.1| 44.0 (10.0–184.0) | <0.001|
| 1/2–3/4                                     | 58 | 81.4 ± 33.1| 79.0 (30.0–175.0) |       |
| >3/4                                        | 18 | 137.3 ± 35.6| 135.0 (63.0–190.0)|       |
| Adhesion                                    |    |            |              |       |
| Y                                           | 20 | 107.6 ± 37.1| 111.0 (60.0–184.0)| <0.001|
| N                                           | 181| 62.4 ± 37.2| 55.0 (10.0–190.0) |       |
| Depth of invasion                           |    |            |              |       |
| Mucosa                                      | 181| 65.8 ± 38.4| 59.0 (10.0–190.0) | 0.210 |
| Submucosa                                   | 20 | 77.6 ± 47.9| 66.0 (17.0–180.0) |       |
| Perforation during procedure                |    |            |              |       |
| Y                                           | 6  | 129.5 ± 45.6| 126.0 (70.0–190.0)| <0.001|
| N                                           | 195| 65.0 ± 37.8| 58.0 (10.0–184.0) |       |

IQR: Interquartile range; SD: Standard deviation; N: No; Y:Yes.
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Corrigendum

Corrigendum: Effects of Adipose-derived Mesenchymal Stem Cell Exosomes on Corneal Stromal Fibroblast Viability and Extracellular Matrix Synthesis

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In the article “Effects of Adipose-derived Mesenchymal Stem Cell Exosomes on Corneal Stromal Fibroblast Viability and Extracellular Matrix Synthesis” which appeared in vol.131, issue 6, pages 704–712 of Chinese Medical Journal,[1] the authors omitted appropriate description about Figures 1, 3 and 4, which were cited from their published work before as reference 14 in the article.[2] The two related manuscripts were rooted in continuous work from the same research. The authors have been authorized to use these figures under Creative Commons Attribution license by International Journal of Ophthalmology Press.

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