Case Report

Esophageal Submucosal Hematoma after Transesophageal Echocardiography under General Anesthesia

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Esophageal submucosal hematoma · Transesophageal echocardiography · Antithrombotic agent

Abstract
Esophageal submucosal hematoma is a rare disease mainly caused by mechanical stimulation to the esophageal wall. We reported a case of esophageal submucosal hematoma after transesophageal echocardiography (TEE) which was performed during cardiovascular surgery. The stimuli of TEE insertion under general anesthesia and the perioperative use of multiple antithrombotic agents were considered as a possible cause. This is the first report of esophageal submucosal hematoma related to TEE, and endoscopic ultrasonography should be carefully performed in patients, particularly at bleeding tendency and without consciousness.

Introduction
Esophageal submucosal hematoma is a rare disease and is caused by mechanical irritation such as accidental ingestion of a foreign body or esophageal pressure symptoms during vomiting. Recently, cases that are thought to be caused by endoscopy have been reported, and
it also has one aspect as an iatrogenic disease. Transesophageal echocardiography (TEE) is used for evaluation of various cardiac diseases e.g., left atrioventricular thrombosis, valvular heart disease, congenital heart disease, infective endocarditis, heart tumor, intraoperative monitoring of open cardiac surgery, and transcatheter aortic valve implantation (TAVI). So far, some iatrogenic adverse events regarding TEE such as tooth damage and upper gastrointestinal bleeding have been reported. Here, we report a case of submucosal hematoma of the esophagus that developed immediately after TEE.

**Case Report**

An 83-year-old woman had shortness of breath during exercise and developed heart failure. Echocardiography revealed severe aortic stenosis, and she was admitted to the department of cardiology to undergo TAVI. Since preoperative coronary angiography showed 75% stenosis in the left anterior descending artery, percutaneous coronary angioplasty (PCI) was performed simultaneously at TAVI. She was taking apixaban 5 mg, clopidogrel 75 mg, and prednisolone 0.5 mg for rheumatoid arthritis. Under the withdrawal of apixaban on the operation day, TEE was inserted under general anesthesia, and PCI was performed, followed by TAVI. During the operation, the TEE remained inserted. A total of 6,000 units of heparin were intravenously injected to prevent blood clots during PCI. After performing subsequent TAVI and confirming the improvement of aortic valve stenosis by TEE, the operation was successfully terminated in 150 min. The total blood loss was 89 mL.

In 30 min after returning to the ward, hematemesis occurred. Chest contrast-enhanced CT showed the thickness of the whole esophageal wall, which suspected hematoma in the esophagus (shown in Fig. 1). Vital signs of the patient were consciousness, JCS I-1; heart rate, 130 beats per minute; systolic blood pressure, 80 mm Hg; oxygen saturation, 98% (oxygen mask 6 L). She also had spontaneous pain in the pharynx. Laboratory data showed anemia with 8.7 g/dL of hemoglobin (shown in Table 1).

Esophagogastroduodenoscopy (EGD), which was performed after blood transfusion and hemodynamic stabilization showed continuous dark red submucosal ridges from the hypopharynx to the esophagogastric junction (shown in Fig. 2), which was diagnosed as submucosal hematoma of the esophagus. Judging from the situation, mechanical irritation associated with TEE insertion during surgery was deemed the cause. Conservative treatment was started with fasting, proton pump inhibitor administration, and blood transfusion under intubation. The administration of antithrombotic agents was discontinued. In second-look EGD on postoperative day 6, the hematoma was slightly flattened, and a shallow longitudinal ulcer was observed in the thoracic esophagus. After extubation, dietary intake was started without swallowing disturbance. In EGD performed on day 39, hematoma completely

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**Fig. 1. Chest contrast-enhancement CT. A whole esophagus is thickened. A hematoma in the upper esophagus of the chest is presented, and a faint contrast effect is expanded over time at the inside of the esophagus. a Noncontrast phase. b Arterial phase. c Venous phase.**
disappeared, and the ulcer was covered with the epithelium (shown in Fig. 3). She continued rehabilitation at our hospital and was discharged on postoperative day 45.

**Discussion**

In 1957, Williams [1] first reported a hematoma under the esophageal mucosa as esophageal mucosal detachment. In Japan, the disease name differs depending on the reporter, e.g., esophageal submucosal hematoma, esophageal intramural hematoma, exfoliative esophagitis, but they are deemed the same pathological condition. In addition to antithrombotic agents, hemodialysis, idiopathic thrombocytopenia, hemophilia, and other blood diseases have been reported as risk factors.

Regarding endoscopy-induced esophageal submucosal hematoma, 14 reports were found by searching for "esophageal submucosal hematoma" and "endoscopy" in the medical journal and PubMed (shown in Table 2) [2–14]. Most of them are associated with endoscopic injection sclerotherapy, which leads to submucosal bleeding by inflammation and tissue necrosis. Two cases of endoscopic submucosal dissection are thought to be caused by mechanical irritation caused by the insertion of an overtube. This disease can be induced by less-invasive endoscopic observation with or without taking biopsy if the patients are under special conditions.

**Table 1. Laboratory data in onset**

| Parameter | Value     |
|-----------|-----------|
| WBC       | 8,400/μL  |
| Hb        | 8.9 g/dL  |
| Plt       | 152,000/μL|
| PT        | 69.5%     |
| PT-INR    | 1.23      |
| APTT      | 26.6 s    |
| AST       | 28 IU/L   |
| ALT       | 26 IU/L   |
| LDH       | 269 IU/L  |
| CPK       | 134 IU/L  |
| ALP       | 138 IU/L  |
| γ-GTP     | 23 IU/L   |
| T-Bil     | 1.3 mg/dL |
| Na        | 142 mEq/L |
| Cl        | 109 mEq/L |
| K         | 4.3 mEq/L |
| BUN       | 25.2 mg/dL|
| Crea      | 0.87 mg/dL|
| CRP       | 0.03 mg/dL|

**Fig. 2.** Endoscopic findings on the postoperative day 0. A continuous dark red submucosal ridge is observed from the hypopharynx to the esophagogastric junction. **a** Hypopharynx. **b** Upper esophagus. **c** Lower esophagus.
such as taking imatinib or antithrombotic agents. The treatment is fasting and proton pump inhibitor administration. Although there are reports of incision drainage performed immediately after hematoma formation, there is a risk of further bleeding and hematoma, and the efficacy of this interventional treatment appears controversial [14].

Here, the cause was deemed mechanical stimulation by TEE insertion under general anesthesia, and the patient could not express possible endoscopic stimuli and subsequent pain. The high-risk situation of bleeding by oral antiplatelet agents, anticoagulant, and heparin will prevent hemostasis in the minute submucosal layer. Additionally, submucosal connective tissue may become weakened by long-term administration of steroids. The clinical course was favorable as the previous papers mentioned, and the esophageal mucosa was improved by conservative treatments without stenosis.

In conclusion, we experienced a rare case of esophageal submucosal hematoma possibly induced by intraoperative TEE. In performing transoral flexible endoscopy including TEE, it is necessary to pay attention to the potential risk of esophageal submucosal hematoma and to gently handle an endoscope, particularly for patients with antithrombotic agents.

**Statement of Ethics**

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. Ethical approval is not required for this study in accordance with local or national guidelines.

**Conflict of Interest Statement**

The authors have no potential conflicts of interest.
| n  | Publication year | First author                  | Age (years old) | Sex  | Antithrombotic agents | Possible causes | Treatments                | Prognosis |
|----|------------------|--------------------------------|-----------------|------|-----------------------|----------------|---------------------------|-----------|
| 1  | 1989             | Inoue et al. [2]               | 63              | Male | –                     | EIS            | Fasting and PPI use       | Cure      |
| 2  | 1989             | Yamaoka and Matumura [3]       | 63              | Female | –                     | EIS            | Fasting and PPI use       | Cure      |
| 3  | 1990             | Ogawa et al. [4]               | 63              | Male | –                     | EIS            | Fasting and PPI use       | Cure      |
| 4  | 1990             | Yamamoto et al. [5]            | 61              | Male | –                     | EIS            | Fasting and PPI use       | Cure      |
| 5  | 1990             | Yamamoto et al. [5]            | 56              | Male | –                     | EIS            | Fasting and PPI use       | Cure      |
| 6  | 1990             | Kamiya et al. [6]              | 49              | Male | –                     | EIS            | Fasting and PPI use       | Death     |
| 7  | 1997             | Kazumori et al. [7]            | 46              | Male | –                     | EIS            | Fasting and PPI use       | Cure      |
| 8  | 1998             | Niki et al. [8]                | 57              | Male | –                     | EIS            | Fasting and PPI use       | Cure      |
| 9  | 2000             | Chihara et al. [9]             | 61              | Male | –                     | EIS            | N/A                       | N/A       |
| 10 | 2001             | Tokumori et al. [10]           | 64              | Male | –                     | EGD            | Drainage                  | Cure      |
| 11 | 2003             | Arita et al. [11]              | 70              | Male | Ticlopidine            | EGD, biopsy    | Fasting and PPI use       | Cure      |
| 12 | 2013             | Nakabori et al. [12]           | 70              | Female | Imatinib              | ESD            | Fasting and PPI use       | Cure      |
| 13 | 2013             | Imamura et al. [13]            | 60              | Female | –                     | EIS            | Fasting and PPI use       | Cure      |
| 14 | 2018             | Saito et al. [14]              | 81              | Male | Asprin                 | ESD            | Fasting and PPI use       | Cure      |
| 15 | 2020             | Our case                       | 80              | Female | Apixaban, clopidogrel | TEE            | Fasting and PPI use       | Cure      |

EIS, endoscopic injection sclerotherapy; EGD, esophagogastroduodenoscopy; ESD, endoscopic submucosal dissection; TEE, transesophageal echocardiography; PPI, proton pump inhibitor; N/A, not assessed.
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Author Contributions

Tsugumi Habu: data curation, formal analysis, investigation, project administration, writing-original draft, and writing-review & editing. Eriko Koizumi: data curation, formal analysis, investigation, and writing-review & editing. Osamu Goto: conceptualization, project administration, supervision, and writing-review & editing. Hiroto Noda, Kazutoshi Higuchi, Takeshi Onda, Jun Omori, and Naohiko Akimoto: data curation and investigation, Mitsuru Kaise and Katsuhiko Iwakiri: supervision.

Data Availability Statement

The data that support the findings of this study are not publicly available due to their containing information that could compromise the privacy of research participants but are available from Osamu Goto upon reasonable request.

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