Case Report

Nonsurgical treatment of 8 cases with esophageal perforations caused by ESD

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Abstract: Background: Esophageal perforation is a serious, but rare complication of high mortality following the endoscopic submucosal dissection (ESD) procedure. The aim of this study is to evaluate the efficacy and safety of nonsurgical treatment of esophageal perforations caused by ESD based on our clinical experience. Methods: From January 2009 to November 2013, 8 patients were diagnosed with endoscopic perforation of the esophagus caused by ESD in our center. All cases were treated with nonsurgical measures, such as metallic clips, conservative treatment alone and therapeutic drainage. Results: The places of perforation were closed by metallic clips immediately in 4 patients. Two patients were cured with conservative treatment alone. Therapeutic drainage with large-bore tube thoracostomy was applied in another 2 patients who had empyema following esophageal perforation. All of the patients were treated nonsurgically, and recovered well. Conclusion: Esophageal perforation caused by ESD can be detected and treated timely, and nonsurgical treatment seems to be a feasible and effective option for clinicians.

Keywords: Endoscopic submucosal dissection, esophageal perforation, nonsurgical treatment

Introduction

Endoscopic submucosal dissection (ESD) has a higher en bloc section and a lower recurrence, but more complications than endoscopic submucosal resection (EMR) for the treatment of esophageal tumors [1, 2]. Because of the absence of serosa in the esophagus, perforations may be detected easily. Recently, the incidence of ESD-related esophageal perforation has risen with increasing use of ESD. Esophageal perforation is a life-threatening complication with a mortality rate of 20% to 30% [3]. Although many treatment options of esophagus perforations have been used to date, the most optimal choice is still controversial [4]. Options for managing esophageal perforation are including the duration, cause, location, severity of the perforation, patients’ age and general health. Surgical therapy is not used in every case. Esophagectomy should be considered in non-healing cases.

This article described a series of 8 ESD-induced perforations which were managed by nonsurgical treatment and recovered well. We shared our experience of treatment of esophageal perforations caused by ESD during the recent years in our center.

Patients and methods

A total of 8 patients were treated for an endoscopic esophageal perforation at the Digestive Medical Center of the Second Affiliated Hospital of Nanjing Medical University from January 2009 to November 2013. Patients came from our endoscopic department or other departments, or were admitted from other hospitals and outpatient clinics. Among of the 8 patients, 2 patients from other departments had empyema secondary to esophageal perforation. All cases agreed to use nonsurgical treatment and wrote informed consent that was obtained from every patient or near relatives.

ESD for esophageal high-grade intraepithelial neoplasia (HGIN) was performed by using standard technique with patients undergoing con-
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Conscious sedation with left lateral position in the hospital endoscopy suite. In order to mitigate mediastinal emphysema in the event of perforation, carbon dioxide insufflation was used throughout the procedure. After operation, an upright chest X-ray and CT were used to assess perforation. This allowed confirmation of the diagnosis as well as an assessment regarding the site and size of the perforation. Clinical symptoms such as chest pain, high fever, and subcutaneous emphysema appeared, perforation may be suspected. If perforation was seen through endoscopy, endoclips (HX-610-135L, Olympus, Tokyo, Japan/Resolution Clip, Boston, USA) were applied to close it with cap assistance immediately. While it was too small to be found through endoscopy, conservative treatment alone was the first choice. Conservative treatment concluded fasting, bed rest, fluid infusion/tube feeding, acid suppression and intravenous antibiotics. Pleural fluid collections demonstrated by CT scan were drained by chest tube placement.

Table 1. Clinical features for 8 patients with esophageal perforation

<table>
<thead>
<tr>
<th>Case</th>
<th>Sex</th>
<th>Age (years)</th>
<th>Diagnosis</th>
<th>Perforation location</th>
<th>Perforation size (mm)</th>
<th>Perforation (hour)</th>
<th>Treatment</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F</td>
<td>66</td>
<td>HGIN</td>
<td>Distal</td>
<td>12</td>
<td>0</td>
<td>Endoscopic clips</td>
<td>Survived</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>62</td>
<td>HGIN</td>
<td>Mid</td>
<td>10</td>
<td>0</td>
<td>Endoscopic clips</td>
<td>Survived</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>50</td>
<td>HGIN</td>
<td>Mid</td>
<td>14</td>
<td>0</td>
<td>Endoscopic clips</td>
<td>Survived</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>74</td>
<td>HGIN</td>
<td>Mid</td>
<td>12</td>
<td>0</td>
<td>Endoscopic clips</td>
<td>Survived</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>49</td>
<td>HGIN</td>
<td>Distal</td>
<td>---</td>
<td>6</td>
<td>Conservative treatment</td>
<td>Survived</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>64</td>
<td>HGIN</td>
<td>Mid</td>
<td>---</td>
<td>12</td>
<td>Conservative treatment</td>
<td>Survived</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>43</td>
<td>HGIN</td>
<td>Mid</td>
<td>24</td>
<td>24</td>
<td>Thoracic drainage</td>
<td>Survived</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>68</td>
<td>HGIN</td>
<td>Mid</td>
<td>26</td>
<td>36</td>
<td>Thoracic drainage</td>
<td>Survived</td>
</tr>
</tbody>
</table>

F, male; M, female; HGIN indicates high-grade intraepithelial neoplasia and it was too small to be found through endoscopy.

Figure 1. CT examination demonstrating empyema in right pleural space in case 8.

The gender distribution was 3 females and 5 males with a mean age of 59 years (range 43-74 years) (Table 1). Four (case 1-4) of the eight perforations (50%) were found during the procedure. Endoscopic clips were applied immediately (Figures 3, 4). The application of clips could prevent contaminating of the mediastinal cavity. Another 2 patients (case 5-6) without initial suspicion of perforation developed post-interventional thoracic pain within 24 hours, and the 2 cases were managed by conservative treatment alone. The remaining 2 cases (case 7-8) who were transferred from the junior hospitals (Figure 1) went on to develop an empyema, and were managed by closed thoracic drainage with large tube in our centre. Two large thoracostomy tubes (32FR) were placed in upper and lower of the chest for draining. A nasogastric tube was inserted through the site of perforation to thoracic cavity. The 2 cases with empyema received dripping with 500 ml saline gentamicin solution through the nasogastric tube for 4-6 h every day (Figure 2). The nasogastric tube was slowly extracted day by day, until the empyema was absorbed. The 2 patients were placed feeding tube to perform for alimentation and recovered well ultimately. No cases required surgical intervention.

Every case needed basic treatment which included decompression, fasting, bed rest, fluid infusion/tube feeding, acid suppression and...
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broad-spectrum intravenous antibiotics. All perforations recovered successfully after conservative treatment. The decision about how to manage every perforation was based on a comprehensive assessment of clinical and imaging parameters.

Discussion

ESD enabled en bloc resection regardless of tumor size or shape [6, 7]. ESD is still associated with various problems, including stricture, perforation and mediastinal emphysem [8]. Esophageal perforation caused by ESD is a fatal complication though it is relatively rare. This emergency condition is still associated with high morbidity and mortality [4]. Therefore, early detection and effective therapeutic management are vital. Diagnosis of esophageal perforation in time can reduce mortality. Treatment strategies include conservative, endoclipping, stent-grafting, tissue shielding and surgical treatment [9-11]. Stent-grafting may be a safe choice for performing closure of esophageal perforations, but it does not benefit mucosal healing, and stent migration is unavoidable. In addition, if the perforation is very proximal or very distal, stents are unsuitable [12, 13]. Considering the number of cases in all studies is small, we lack the evidence of the superiority of any treatment method over all others. So the optimal management is controversy. The best choice should be made by the causes, the time, severity, location, definite diagnosis and treatment of esophageal perforation etc.

The criteria for nonsurgical treatment of esophageal perforation was defined by Shaffer et al. Nonsurgical treatment is the treatment of choice in cases which the patient has suspected or limited perforation, minimal symptoms, an entumritional injury in the cervical region, a drained cavity in the esophagus, and no obstructive neoplasm [14, 15]. Our series showed that all patients were diagnosed, intervened timely, and no case died. Among these treatments, endoscopic clipping seemed to be a simple and effective technique. Minami et al. reported a success rate of 98% (115/117 patients) for closing gastric perforations caused by ESD for early stomach cancer [16, 17]. Qadeer et al. reported that endoclips were effective for closing both acute and chronic esophageal perforations [17]. In our opinion, ESD-related esophageal perforations can be
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closed by clips when the perforation is recognized immediately through endoscopy and the surrounding mucosa is intact. If the diameter < 1 cm, endoclips may be an optimal choice. Immediate clip closure can avoid spillage of gastroesophageal contents and mediastinal infection. Nasogastric tube drainage is used to prevent the injury from gastric acid reflux [18]. Not only small esophageal perforations but also larger ones can be closed by clip [17-19].

Maeda et al. pointed out that insufflation of CO₂ rather than air during esophageal ESD significantly reduced post procedural mediastinal emphysema [20]. Because CO₂ can be easily absorbed. In the procedure of ESD, we also chose insufflation of CO₂ instead of air. Nonsurgical treatment was also found to be safe and effective for the relative severity of patients presenting with empyema following esophageal perforation in our study. Despite the relative severity of the perforation, case 7-8 still were managed successfully by nonsurgical treatment without serious complications.

In this study, all the cases were mananged successfully with nonsurgical treatment. The main reason was that perforation was small and diagnosed and treated without any delay. Detection and aggressive management in time are vital. The number of cases in our study is small, and thus further studies with larger numbers and more detailed data are required to be carried out to establish the benefits and risks of nonsurgical treatment with esophageal perforations caused by ESD.

Conclusion

This study confirms nonsurgical treatment can be used to treat esophageal perforations caused by ESD in a cohort of patients without delay in diagnosis and intervention.

Acknowledgements

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Disclosure of conflict of interest

None.

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References

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