

Follow-up outcomes of corrosive esophageal strictures with different endoscopic therapy: A case report

Haixia Wang¹ and Wei Tao²

¹Zigong First People's Hospital

²General Hospital of Ningxia Medical University

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Authors: Haixia Wang MD¹. Wei Tao PD²

Affiliation: ¹Department of Gastroenterology, Zigong First Peoples Hospital; ²Department of Gastroenterology, General Hospital of Ningxia Medical University

corresponding author: Wei Tao; tw475006@163.com

Ethics approval

The principles outlined in the Declaration of Helsinki was followed. The subject of the case report provided informed consent to publish the included information.

Patient Anonymity and Informed Consent: Obtained informed consent from the patient.

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Objective Oral corrosive substances can cause esophageal or gastrointestinal strictures, leading to malnutrition and gastrointestinal dysfunction, directly affecting the patients' quality of life. The aim of the case was to compare the efficacy of different endoscopic therapy methods.

Keywords corrosive esophageal strictures; endoscopic therapy; dilatation; stent placement; endoscopic radial incision

Abbreviations

CES: corrosive esophageal strictures

ERI: Endoscopic radial incision

Corrosive esophagitis is characterized by caustic injury due to the ingestion of chemical agents, mainly alkaline substances such as detergents, cleaning compounds, and bleaches[1]. The severity of the injuries caused by caustic ingestion depends on gastric contents and caustic agent properties, including pH, concentration, ingested volume, and tissue contact duration[2]. In general, tissues are more severely damaged by alkaline solutions than by acidic solutions. This is because alkalis cause liquefactive necrosis, while acids cause coagulative necrosis resulting in eschar formation, thereby protecting the mucosal epithelium from deep ulcer formation. High-degree corrosive esophagitis may result in esophageal bleeding, perforation, and even death in the worst cases. In particular, esophageal strictures are one of the more serious complications of corrosive esophagitis. corrosive strictures are frequently very tight, long, eccentric, and multiple, and may require recurrent endoscopic therapy procedures, which are highly expensive. There is a belief that these patients have a very high stricture recurrence rate because of extensive esophageal damage and fibrosis. For these reasons, patients with corrosive strictures often undergo surgery In the past, which carries significant morbidity and mortality. But now, early endoscopic therapy is very useful in cases of corrosive esophageal strictures(CES), not only for determining the degree of mucosal injury and severity but also for predicting prognosis[3].

Current endoscopic management for CES includes esophageal dilatation, stent placement, endoscopic incision, injection of steroids into the strictures segment, and so on[4]. The foremost goal of therapy for CES is to preserve the esophagus and restore its function. Dilatation has been considered as the therapy of choice for CES and can be performed endoscopically, using a balloon dilator or rigid dilator. Esophageal stent placement or endoscopic incision is indicated when dilatation is not successful. Several case series reports have shown that endoscopic therapy is a safe and effective therapy with CES[5-7]. However, there is still a lack of a well-established consensus on when and how to optimize endoscopic therapy with CES. Here, we report the case of a male Chinese patient with CES with scar constitution due to the ingestion of caustic soda achieved a favorable outcome after repeated different endoscopic therapy to compare the safe and effectiveness of different endoscopic therapy.

Case

A 36-year-old male ingested approximately 100 mL of caustic soda liquid(sodium hydroxide) in a suicide attempt. he presented to our emergency department after 2 hours on November 13, 2016 with nausea, vomiting, retrosternal pain, hematemesis (approximately 100mL), and dyspnea. He was belonged to the scar constitution previously. Upon admission, Physical exam was positive for tachycardia, tachypnea, and coarse respiratory sounds.and body temperature was 37.9, blood pressure was 108/62mmHg. The oropharyngeal injury and hemorrhagic, however, her abdomen was flat and soft. Bowel sounds were normal. Although marked epigastric tenderness was present, there was no rebound tenderness or guarding. His complete blood count and biochemistry tests were in normal ranges, except for a white blood cell count of $20.93 \times 10^9/L$, neutrophils $16.94 \times 10^9/L$, and neutrophil percentage 80.9%. contrast-enhanced computed tomography (CT) Chest and CT of the whole abdomen revealed no esophageal or gastrointestinal perforations. During hospitalization, The major short-term complications of pneumonias, hemorrhage, and airway obstruction with the patient. His therapy included tracheotomy, intravenous fluid, total parenteral nutrition, H2 receptor blocker, antibiotherapy, , and other symptomatic therapies. And he can drinking water slowly without choking and coughing until day 10, and was allowed to eat fluids until week 2 . Initial endoscopy was withheld because there was a high risk of esophageal or gastric perforation. Besides, The patient underwent upper gastrointestinal endoscopy on week 4 after admission revealed multiple serious strictures in the whole of esophagus(Fig. 1). It was concordant with the grade IIb of caustic esophageal injury classification defined by Zargar et al.[8]. Finally, the patient was diagnosed with CES caused by sodium hydroxide. He is a scar constitution, surgery was traumatic and risky, and the patient refused to undergo surgical therapy, so he was fed by nasogastric tube.

11 weeks later, the patient underwent a gastroscopy (Fig. 2), which found that "a stenotic segment was visible at a distance of 16-20cm from the hilar tooth and the gastroscope (Olympus GIFXP260: 9 mm) could not be passed". After absolute contraindications were ruled out, the patient was treated with careful serial graded dilatations by selecting an initial dilator size based on the estimated stricture diameter(diameters of 7mm,

9mm, 11mm, 13mm, 15mm), the number of bougies [?]3 at a time. From January 22, 2017, to February 19, 2017, the patient used to be handled with weekly dilatation per week, with unfavorable outcomes after 5 therapies. Esophageal stent placement or ERI was indicated when dilatation is not successful. After that, the patient was treated endoscopically if the Stooler[9] grade of his dysphagia was [?]2. From February 26, 2017 to April 19, 2018, The patient underwent 4 times stent placement (The average remission time of his dysphagia was 47.25 days) combined with intermittently dilatation 13 times (the average remission time was 18.85 days) to improve esophageal dysphagia. Due to scar constitution, stent migration, stent dislocation, and so on, the patient still had recurrent dysphagia. So from May 17 to September 27, 2018, the patient underwent endoscopic radial incision (ERI) for 4 times (the average time of remission was 59.75 days) while taking oral steroids (the initial amount was 30 mg qd, and the amount was reduced by 5 mg every 2 weeks until the drug was stopped. During the period of oral steroids, the patient was treated with ERI 3 times and once stenting, the mean remission time was 33.25 days) and once ERI, after therapies his dysphagia improved significantly. However, the patient reoccurred dysphagia grade 3 again after 5 months, he chose dilatation 6 times again from February 24, 2019, to September 15, 2019 (the average remission time was 37.83 days), and then he was stented 1 time (the remission time was 98 days). Implanted stents was difficult to take out several times due to the severe scar hyperplasia (Fig. 3), so that the patient was continued to be maintained on dilatation 6 times (the average remission time was 127.33 days). The patient had no similarly esophageal strictures and able to eat solid food at 2 years of follow-up. The therapy has achieved a favorable outcome (Figure 4).

The patient underwent endoscopic dilatation therapy 30 times, stent placement 6 times, ERI 4 times, and oral hormones for 3 months during the 6-year course of the disease. The number of therapies per year decreased with the duration of the disease, and the remission time to dilatation gradually increased. ERI had the longest average remission time among the 4 therapy modalities and the shortest remission time for oral hormone(Table 1).

A favorable outcome was defined as patients being able to swallow solid or semisolid food and maintain a nutritional status for [?]6 months without any endoscopic therapy or surgical intervention[2].

Table1 Remission time to after different endoscopic therapies

	The number of therapies[n]	$\bar{x} \pm s(\text{day})$
Dilatation	30	45.84 ± 61.27
Stent placement	6	52.33 ± 30.32
ERI	4	59.75 ± 59.61
Endoscopic therapies during oral hormone	4	33.25 ± 7.41

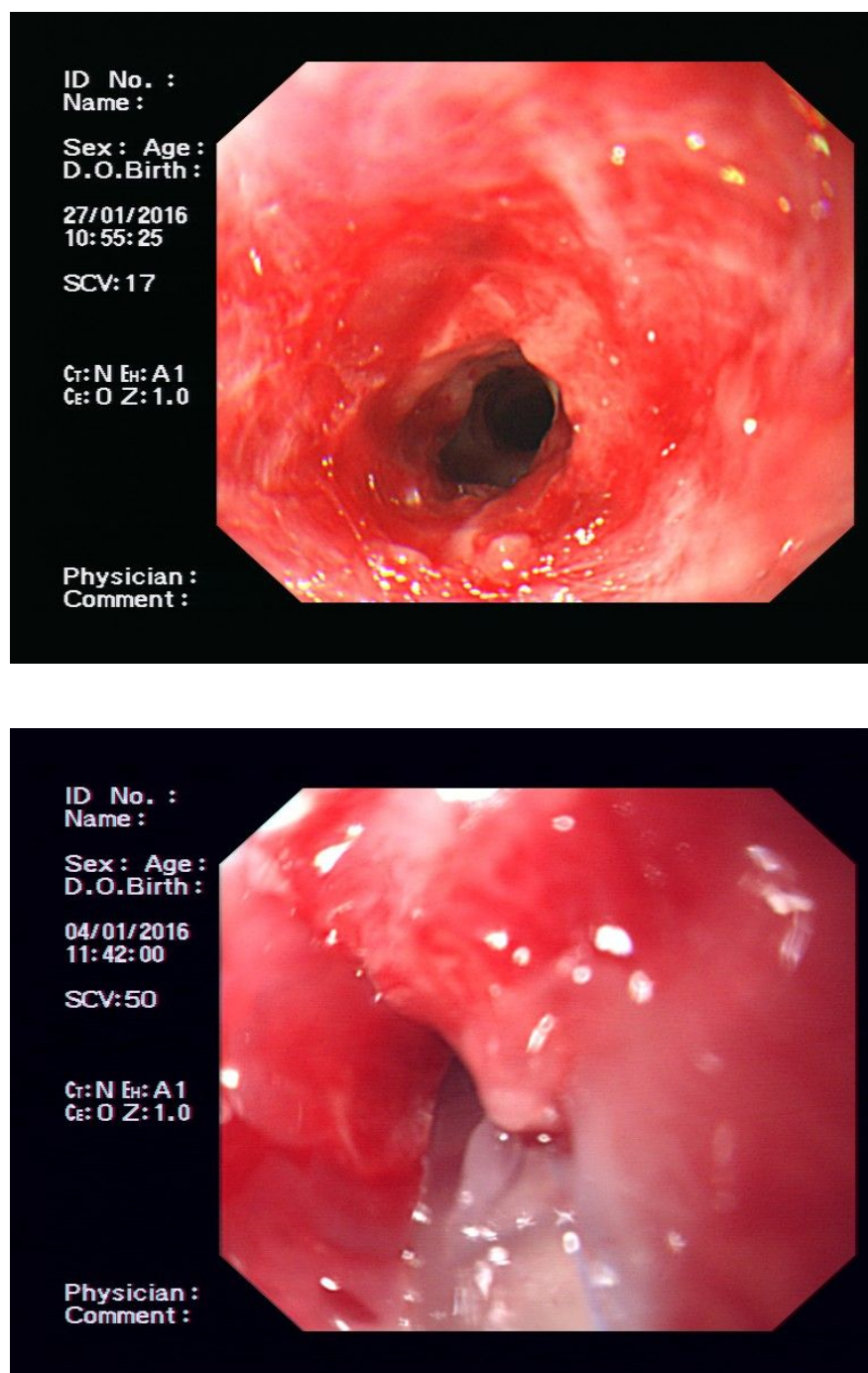


Fig.1 Fig.2

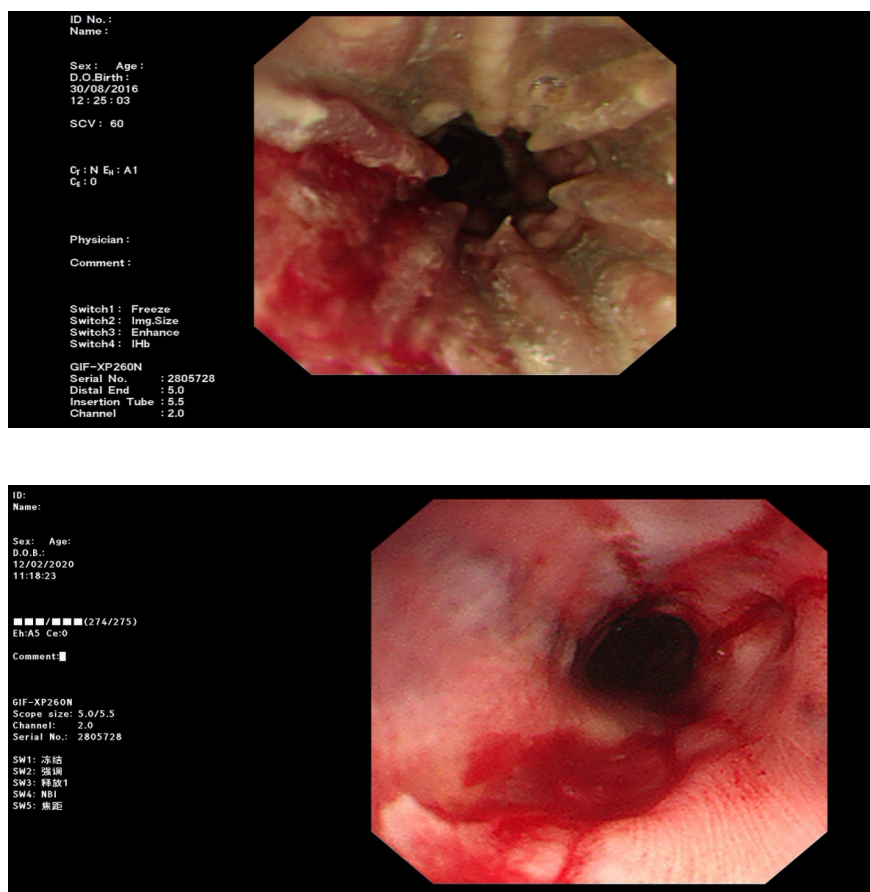


Fig.3 Fig.4

Discussion

Corrosive esophagitis is characterized by caustic injury following the ingestion of chemical agents. Esophageal bleeding, perforation, or stricture can be worsened by high-degree corrosive esophagitis. Alkalis substances may cause severe post-corrosive injuries of the upper gastrointestinal tract, including perforation that often results in death. The most common complications are esophageal and gastric strictures, which are found in greater percentages than in poisonings with acid substances. Strictures of the esophagus may appear three weeks after ingestion of the corrosive substance, in the first three months, or according to some authors, even after one year following caustic ingestion[10]. Liquid corrosive substance ingestion more often initiates stenosis than corrosive substances in crystal form. Currently, the majority of endoscopists recommend early endoscopy to determine the severity and extent of the injury and thereby predict prognosis. However, comprehensive guidelines informing the timing and patient selection for endoscopy following ingestion of caustic agents have yet to be established. The timing recommended in the literature remains particularly controversial. Numerous studies recommend that the most optimal timing for esophagogastroduodenoscopy is the first 12–24 hours post-ingestion[11]. Conversely, other studies recommend endoscopy should be performed between 24 hours and 48 hours as damage will have yet to mature before 12 hours and will therefore be underestimated by examination. Since the initiation of fibroplasia, inflammatory changes, and the healing process of the post-corrosive injuries begin on the 5th and are most intensive until the 15th day, it is suggested to avoid endoscopy during this period.

Scarring stricture is very difficult to treat in clinical practice. Esophageal or gastric strictures can cause many symptoms such as dysphagia, and malnutrition, which seriously affects the quality of patients' life[12-13]. It

is especially important to choose the appropriate therapy plan in time to reduce complications and mortality. In recent years, endoscopic therapy has become the optimal therapy method for benign esophageal strictures. Corrosive esophageal stricture is common with complex stenosis. For esophageal strictures, endoscopic therapies include dilatation, stent placement, endoscopic dissection, medication, and cell transplantation, all of which can relieve dysphagia.

Benign esophageal strictures using different endoscopic therapy is considered safe and effective for both short and long-term relief of dysphagia. endoscopic therapy, rather than surgery, has therefore been suggested as the primary therapy for most of these patients. The reported experience is mostly in patients with peptic strictures and there is little information on the efficacy and safety of different endoscopic therapy in patients with CES. Due to this lack of formal criteria, we are still unable to clarify how to choose the optimal endoscopic therapy method based on the situation of patients with benign esophageal strictures. many scholars suggested that the decision to select the type of endoscopic therapy is based on the assessment of stricture (simple vs complex), length and distal extent of the stricture, and the experience of the endoscopist[14]. Here, We describe first the case of a patient who ingested sodium hydroxide and consequently presented with CES, moreover, he was treated with multiple endoscopic methods. Since the esophageal strictures were located in the upper and the high risk of surgery, the patient chose endoscopic therapies. During the 6-year period, By comparing the remission time of these 4 endoscopic therapies, we found that ERI had the longest remission time, and the shortest was oral hormone, and the remission time continued to lengthen as the number of therapies increased, besides the therapeutic efficacy became more and more favorable.

In this case, the patient was initially treated with bougie dilatation. During the dilatation process, we started with a 7-mm bougie according to the degree of stenosis, and then increased the diameter of dilatation step by step to expand the stenosis to the maximum extent possible, and then decided to terminate the diameter of the bougie according to the patient's condition. We found that the strict implementation of these procedures helped prevent complications and avoid restenosis after therapy. The shortest remission time with oral hormone therapy may be related to the Koebner[15] phenomenon, which can induce ulcers, affect wound healing, and let to proliferate faster since scar constitution. For complex benign esophageal strictures, ERI has been observed to have a longer remission time and better efficacy than other endoscopic therapies in clinical practice and can be the therapy of choice.

Complex esophageal strictures usually requires numerous endoscopic therapies. There is no consensus endpoint for endoscopic therapy, and which is optimal therapy[4]. some person suggested that endoscopic dilatation is the first choice for certain peptic strictures. But for complex strictures, dilatation can not offer durable remission, so the requirement for multiple dilatation treatment sessions. Stenting or endoscopic incision may be performed in patients with complex stenosis who achieve a unfavorable outcome with repeated dilatation21. xx reported that stents could achieved a satisfactory improvement/resolution of the refractory strictures with a success rate of 35%–45%; however, migration rates(25%–35%) and adverse events (20%–25%) are fairly common[16]. A study by Manabu Muto[17] et al. showed that radial incision and cutting is an effective and safe method for gastroesophageal anastomotic strictures that are refractory to repeated endoscopic dilation, at the same time radial incision and cutting also avoided perforation and bleeding, which is consistent with our conclusion. For CES, the use of steroids remains controversial. Using steroids is believed to inhibit the inflammatory response and consequently reduce the stricture formation. Studies have shown that the use of steroid injections, in conjunction with antisecretory therapy and dilations, reduces the number of repeat dilations and increases the dilation-free period[18-19]. But the effectiveness of using steroids was not satisfactory in the case. Therefore, we believe that the preferred choice of steroids for CES is not recommended.

In summary, complex esophageal strictures due to corrosive esophagitis combined with scar constitution is difficult to treat, and a favorable outcome can be achieved after numerous endoscopic therapies. What's more, the ERI and occasionally stents can provide durable remission for such patients, which is safe and effective in clinical practice. But more better modalities can provide durable efficacy need to be investigated further.

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