Case Report:
POST ESOPHAGECTOMY ESOPHAGEAL RECONSTRUCTION IN ESOPHAGEAL INJURY DUE TO CAUSTIC MATERIALS

Edwin Danardono
Division of Digestive Surgery, Department of Surgery, Faculty of Medicine, Universitas Airlangga,
Dr. Soetomo Hospital, Surabaya

ABSTRAK

Cedera kaustik esofagus merupakan hal yang jarang terjadi, namun membutuhkan penanganan yang tepat dan kompleks. Berbagai macam tehnik rekonstruksi telah di lakukan, namun meskipun dengan bertambahnya volume, angka kejadian komplikasi masih relatif tinggi. Kami melaporkan pengalaman di senter kami untuk rekonstruksi esofagus pada pasien-pasien dengan cedera kaustik esofagus yang menyebabkan striktur esofagus antara tahun 2014-2017. Penelitian ini menggunakan metode case series dengan tinjauan pustaka. Hasil menunjukkan bahwa antara tahun 2014-2017 terdapat 3 pasien dengan cedera kaustik esofagus. Semua pasien yang menjalani operasi rekonstruksi esofagus termasuk dalam kondisi malnutrisi. Dua disebabkan oleh HCl dan sisanya oleh NaOH. Semua pasien menjalani reseksi segmen esofagus yang striktura, baik dengan parsial maupun total esofagektomi. Leakage anastomosis terjadi pada semua kasus, namun membaik dengan penanganan konservatif. Rata-rata lama rawat inap adalah 27 hari. Pasien kehilangan darah intraoperatif berkisar antara 450-700 cc. Sebagai simpulan, tatalaksana awal yang tepat dapat mempersiapkan pasien dengan baik untuk tindakan operasi definitif atau rekonstruksi, khususnya untuk menghindari malnutrisi. Rekonstruksi yang ideal masih belum dapat ditetapkan, dan angka komplikasi paska operasi masih tinggi. Lama rawat inap pasien juga relatif panjang. ***(FMI 2017;53:287-291)***

Kata kunci*: Esofagektomi; rekonstruksi esofagus; cedera esofagus; bahan kaustik*

ABSTRACT

The esophageal caustic injury is rare, but it requires precise and complex management. A variety of reconstruction techniques have been done, but despite the increasing volume, the incidence of complications is still relatively high. We reported the experience in our center in handling esophageal reconstruction in patients with caustic esophageal injury that caused oesophageal stricture between 2014-2017. This study used case series method with literature review. The results showed that between 2014-2017, there were 3 patients with caustic esophageal injury. All patients undergoing esophageal reconstruction surgery were included under conditions of malnutrition. Two were caused by HCl and the rest by NaOH. All patients underwent a resection of stricture segment of the esophagus, either using partial or total esophagectomy. Anastomosis leakage occurred in all cases, but improved with conservative treatment. The average length of hospitalization was 27 days. The intraoperative blood loss in patients ranged from 450-700 cc. In conclusion, proper preliminary management can provide approppiate preparation of the patients for definitive or reconstructive surgery, especially to avoid malnutrition. The ideal reconstruction still could not be established, and the rate of postoperative complications was still high. The length of patient hospitalization was also relatively long. ***(FMI 2017;53:287-291)***

Keywords*: Esophagectomy; esophageal reconstruction; esophageal injury; caustic materials*

Correspondence: Edwin Danardono, Division of Digestive Surgery, Department of Surgery, Faculty of Medicine, Universitas Airlangga, Dr. Soetomo Hospital, Jalan Prof Dr Moestopo 6-8, Surabaya 60286, Indonesia.
Email: edwin.digestive@gmail.com

INTRODUCTION

Esophageal injury caused by chemical trauma is relatively rare. In these cases, the extension of damage occurs with respect to the amount, concentration, type of chemicals and immediate surgical treatment (Cattan et al 2000). If, for example, the amount of penetrating chemicals is small and alkaline, the main damage will occur in the esophagus, but will be less in the stomach, where the liquid will experience dilution and neutralization. Conversely, strong acidic liquids can cause extensive damage outside the gastrointestinal tract (Cattan et al 2000, Yeo 2013). Preliminary management of caustic trauma according to the Advanced Trauma Life Support (ATLS) guidelines is the stabilization of patients by paying attention to airways, breathing, circulation, disability and environment (exposure). Once the patient is stable, special diagnostic is required to determine the extent and degree of damage that occurs. Upper gastrointestinal endoscopy may be performed as early as possible, as does tracheobronchial endoscopy to detect tracheal damage, which is related to management

flows. If there are clinical signs that require exploration, no ultrasound or CT scan is necessary, especially as this will extend pre-operative time (Cattan et al 2000). Conversely, in non-severe cases without clinical signs requiring exploration, non-invasive testing may be performed.

In general, the management of caustic injuries can be divided into 3 phases: 1) the initial phase of arrival, in which when an immediate assessment of the extent of injury occur, resuscitation and action are required; 2) the intermediate phase, in which patients treated for injury require sepsis, nutrition and prevention of complication management. In this phase, further management planning is needed to avoid actions that potentially interfere with definitive treatment, such as operations involving organs that will be planned for reconstruction; 3) chronic phase, in which the patient has recovered from his injury, but requires further action because the healing of esophageal injury has resulted in stricture. In this phase, patients may still need intensive psychosocial and nutritional support (Yeo 2013). Acute phase requires surgery in case of severe damage or perforation of the gastrointestinal organs. The most common procedure in this phase is esophagogastrectomy, and the predictors of mortality are the time span from trauma to surgery of >24 hours, renal failure, metabolic acidosis and pancreatic injury (Javed et al 2012).

In patients with chronic oesophageal stricture, the action to overcome the food passage disruption is required. The option of action that can be done is endoscopic esophageal dilatation or surgery to replace the stricture of the esophagus. Historically, there is an option for reconstruction of the esophagus without resection of a stricture segment by using a flap, but this option has been abandoned because of complications and poor effectiveness (Yeo 2013). The main indications for bypass or resection and esophageal bypass are stricture with long segments and multiple strictures along the esophagus (Ezemba 2014). In short stricture, where the endoscope can still be passed and the guidewire can be installed, endoscopically dilatation can be performed.

There are several options for surgical procedures on esophageal stricture due to caustic injury which are summarized in Fig. 1.

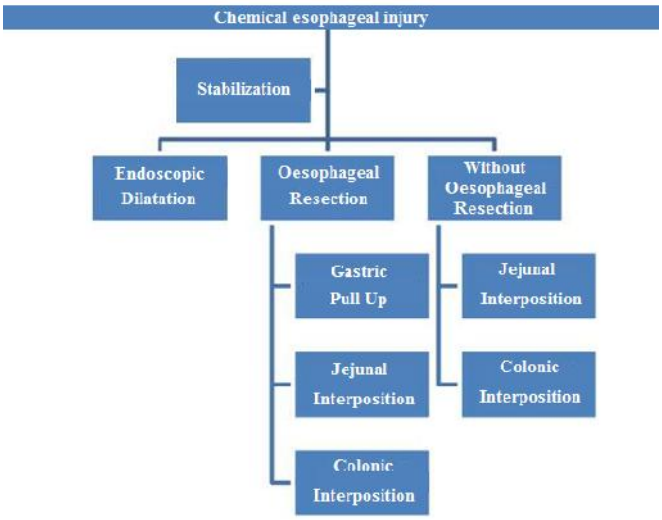

Fig. 1. Therapy options for esophageal stricture due to caustic trauma.

In cases where the esophagus is not resected, esophageal replacement is placed in the anterior, while esophageal stricture is left in place. If the esophagus is resected, an esophageal replacement may be placed intrathoracally or anteriorly. The degree of severity of caustic injury based on an endoscopic examination is shown in Table 1.

CASE REPORT

Cases with caustic material ingestion trauma are rarely found in our center. From 2009 to 2014, there were 8 cases (Syafreadi 2014). We reported 3 cases with post-traumatic caustic esophageal stricture treated at Dr. Soetomo Hospital, Surabaya from 2014 to 2017, whose characteristics are described in Table 2.

Table 1. Grades of caustic injury based on endoscopic examination (Yeo 2013)

	Grade 1	Grade 2	Grade 3
	Edema or mucosal hyperemia		
A		Fragility, erosion, exudate	Areas of necrosis scattered in black or gray
B		Same with A, plus ulceration or circumferential	Large necrosis area

Table 2. Characteristics of patients with caustic esophageal trauma from 2014 to 2017

Characteristics	Case 1	Case 2	Case 3
Age	16	29	41
Sex	Male	Male	Male
Caustic material	NaOH	HCl	HCl
Main complaint	Unable to swallow	Unable to swallow	Unable to swallow
Duration	5 months	4 months	3 months
Complications	Malnutrition	Malnutrition	Malnutrition Gastrostomy
Diagnose	1/3 distal esophageal stricture	1/3 distal esophageal stricture	1/3 distal esophageal stricture
Managements	Esophagectomy	Esophagectomy	Esophagectomy
Reconstruction	Left colon interposition	Gastric pull up	Right colon interposition
Neophysophage position	Antesternal	Intratorachal	Intratorachal
Anastomosis position	Cervical	Cervical	Intratorachal
Early complications	Anastomosis leakage	Pneumonia Anastomosis leakage	Anastomosis leakage Left pneumothorax
Operation duration	6 hours	6 hours	6.5 hours
Bleeding during operation	450 cc	500	700 cc
Length of stay	30 days	24 days	28 days
Follow-up	No complaint	No complaint	No complaint

DISCUSSION

The duration of surgery in our series was between 5-6.5 hours, while in other series, the reported durations were between 4.5-6.8 hours (Ezemba 2014) and 2.5-5 hours (Boukerrouche 2013). The shortest duration occurs when partial resection of the esophagus and reconstruction is done using gastric pull up. Bleeding during the operation is between 450-700 cc, which is similar to those in other serial reports (Ezemba 2014). In our series, no deaths were found during hospitalization, while in the larger series, the hospital mortality rate was between 3.3-9.5% (Ezemba 2014, Boukerrouche 2013). Colon interposition was reported to have satisfactory results, although the mortality rate in hospitals was still quite high, mainly due to graft death (Ezemba 2014, Hadidi 2006, Knezevic et al 2007, Bassiouny & Bahnassy 1992).

In the cases in our series, the caustic material was mostly HCl, while in other series of 85.7% was NaOH (Ezemba 2014). In all of our cases, the accidental drinking occurred because the liquid was assumed as drinking water (placed in incorrectly labeled bottle). All anatomical damages occurred in distal esophagus and the stomach was not involved, possibly because the amount of the liquid was not too much, so it had been diluted in the stomach. Gastric mucosa is also more resistant to low pH. If the irritant material is alkaline, it will be neutralized partly by the gastric juice which reduces the viscosity of the fluid when entering the stomach.

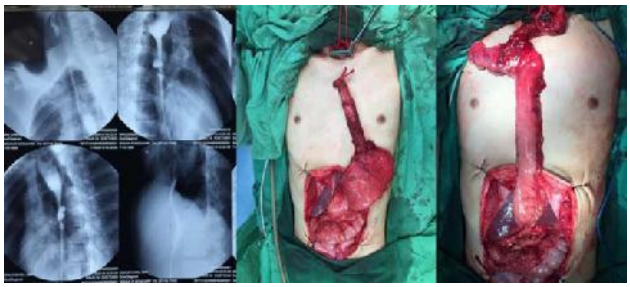

Fig. 2. Illustration of case 2 with oesophageal stricture due to caustic material. From left to right: an esophagogram showing stricture; post dissection and proximal esophageal resection; gastric tubing and pull ups for esophageal reconstruction.

Colon interposition was performed in 2 of 3 patients because the esophageal segment had a long stricture and the stomach was dysfunctioned (previous gastrostomy was performed at the site for gastric tubing). Another series showed considerable use of colon interposition, where 70-90% of all patients underwent esophageal reconstruction due to caustic stricture (Javed et al 2012, Bassiouny & Bahnassy 1992, Javed & Agarwal 2013). The advantage of colon use, both the left and right

colon, is that the length of the segment is adjustable and capable of reaching anastomosis in the cervical part of the esophagus without vascularization interruption (Jiang et al 2005). The colon peristaltic function is also capable of replacing esophageal peristaltic function in isoperistaltic reconstruction. However, peristaltic direction and colon side that will be used does not seem to have much effect on the complications and the success of the surgery (Javed et al 2012, Ezemba 2014, Knezevic et al 2007, Bassiouny & Bahnassy 1992, Jiang et al 2005, Javed & Agarwal 2013, Tran Ba Huy & Celerier 1988).

Fig. 3. Illustration of case 2 with oesophageal stricture due to caustic material. Left: post-surgery esophagogram, indicating anastomosis leakage that is handled conservatively. Right: clinical condition of the patients before discharged.

The entire esophagus was removed in all cases. Pathologic esophageal resection is an option because of the high number of potential malignancies in the pathologic esophagus if it is abandoned. However, colon segment that replaces the esophagus may still be malignant (Yeo 2013, Javed et al 2012, Javed & Agarwal 2013, Houghton et al 1989). The option of laparoscopic surgery for colonic or gastric pull ups has the advantage of faster recovery, less analgesic needs and less blood loss, but leaves esophageal stricture (Javed & Agarwal 2013). The length of the interval between caustic injury and the appearance of carcinoma in the scarred area can be very long, which may reach 30-46 years and the highest incidence is 7.2% (Jiang et al 2005).

There were no patients in our series who had tracheoesophageal fistulas. The incidence in adult patients was reported to be low (2.6%) (Gupta et al 2015). The length of hospitalization of the patients in our series was 27 days on average (median 28 days) and longer than that which was reported in other series in the literature, i.e. 12-21 days (median 14 days) (Boukerrouche 2013). This may be associated with preoperative malnutrition in the majority of patients due to the lack of post-injury nutritional intake and the presence of anastomosis leakage.

All three patients in our series experienced anastomosis leakage that may be associated with malnutrition. The overall anastomosis leakage rate ranges from 20% -30% in the larger series (Yeo 2013, Boukerrouche 2013, Bassiouny & Bahnassy 1992, Zhou et al 2005) and does not decrease much even though the operating volume increases. In our series, the entire anastomosis leakage closes after conservative treatment, although reportedly some cases required operative management to deal with postoperative complications (Deng et al 2008).

CONCLUSION

The management of caustic injury in the esophagus is a challenge for a digestive surgeon. Proper preliminary management can provide appropriate preparation of the patients for definitive or reconstructive surgery, especially to avoid malnutrition. The ideal reconstruction still cannot be established, and the rate of postoperative complications is still high. The length of patient hospitalization is also relatively long.

REFERENCES

Bassiouny IE, Bahnassy AF (1992). Transhiatal esophagectomy and colonic interposition for caustic esophageal stricture. J Pediatr Surg 27, 1091-5

Boukerrouche A (2013). Left colonic graft in esophageal reconstruction for caustic stricture: mortality and morbidity. Dis Esophagus 26, 788-93

Cattan P, Munoz-Bongrand N, Berney T, Halimi B, Sarfati E, Celerier M (2000). Extensive abdominal surgery after caustic ingestion. Ann Surg 231, 519-23

Deng B, Wang RW, Jiang YG, Gong TQ, Zhou JH, Lin YD, et al (2008). Prevention and management of complications after colon interposition for corrosive esophageal burns. Dis Esophagus 21, 57-62

Ezemba N, Eze JC, Nwafor IA, Etukokwu KC, Orakwe OI (2014). Colon interposition graft for corrosive esophageal stricture:midterm functional outcome. World J Surg 38, 2352-7

Gupta V, Kurdia KC, Sharma A, Mishra AK, Yadav TD, Kochhar R (2015). Tracheoesophageal fistula in adults due to corrosive ingestion: challenges in management. Updates Surg 67, 75-81

Hadidi AT (2006). A technique to improve vascularity in colon replacement of the esophagus. Eur J Pediatr Surg 16, 39-44

Houghton AD, Jourdan M, McColl I (1989). A carcinoma after colonic interposition for oesophageal stricture. Gut 30, 880-1

Javed A, Agarwal AK (2013). Total laparoscopic esophageal bypass using a colonic conduit for corrosive-induced esophageal stricture. Surg Endosc 27, 3726-32

Javed A, Pal S, Krishnan EK, Sahni P, Chattopadhyay TK (2012). Surgical management and outcomes of severe gastrointestinal injuries due to corrosive ingestion. World J Gastrointest Surg 4, 121-5

Jiang YG, Lin YD, Wang RW, Zhou JH, Gong TQ, Ma Z, et al (2005). Pharyngocolonic anastomosis for esophageal reconstruction in corrosive esophageal stricture. Ann Thorac Surg 79,1890-4

Knezevic JD, Radovanovic NS, Simic AP, Kotarac MM, Skrobic OM, Konstantinovic VD, et al (2007). Colon interposition in the treatment of esophageal caustic strictures: 40 years of experience. Dis Esophagus 20, 530-4

Syafreadi, Danardono E, Budipramana VS (2014). Right colon interposition pada pasien dengan caustic esophagela stricture

Tran Ba Huy P, Celerier M (1988). Management of severe caustic stenosis of the hypopharynx and esophagus by ileocolic transposition via suprahyoid or transepiglottic approach. Analysis of 18 cases. Ann Surg 207, 439-45

Yeo CJ (2013). Shackelford's surgery of the alimentary tract. Philadelphia, Elsevier Health Sciences

Zhou JH, Jiang YG, Wang RW, Lin YD, Gong TQ, Zhao YP, et al (2005). Management of corrosive esophageal burns in 149 cases. J Thorac Cardiovasc Surg 130, 449-55