

Esophageal Dilatation in Patients with Esophageal Stricture Formation due to Corrosive Intake - Clinical Experience of Thoracic Surgery Department at A Tertiary Care Center

SULTAN AHMED¹, TAYYEBA KIRAN², ASIA RABBANI³, RIZWAN SADIQ⁴, MUHAMMAD ABBAS ZAFAR⁵, USAMA ZAFAR⁶

¹AP and HOD Thoracic Surgery Department, SZH, RYK

²MO and Registrar Thoracic Surgery Department, SZH, RYK

³HO Thoracic Surgery Department, SZH, RYK

⁴HO Thoracic Surgery Department, SZH, RYK

⁵PGR Thoracic Surgery Department, SZH, RYK

⁶AP/MO Thoracic Surgery Department, SZH, RYK

Correspondence to Dr. Rizwan Sadiq; rizwansadiq94@gmail.com +92-301-7611866

ABSTRACT

Objective: Assessment of the outcome of esophageal dilatation in patients with esophageal stricture formation due to corrosive intake experienced at a tertiary healthcare facility in order to devise a better management plan for such patients.

Study design: Retrospective Study

Study setting: Sheikh Zayed Medical College/Hospital, Rahim Yar Khan.

Study duration: January 2018-June 2021

Methodology: A total of 19 subjects who presented with esophageal stricture formation due to corrosive intake were taken as study subjects. The location of involved mucosa, number of dilatation sessions done, level of symptomatic relief and recurrence rates were assessed for these study subjects. Then the data was gathered and analyzed with the help of SPSS Version. 21.

Results: This study comprising of 19 patients who had esophageal stricture formed due to corrosive intake and they underwent esophageal dilatation for it. The age range for the subjects came out to be 5-40 years (Mean= 2.89±8.81). Male to female ratio came out to be 7(36.8%) vs 12(63.2%) respectively. Among these study subjects, 15(78.9%) subjects gave history of an acid ingestion while only 4(21.1%) had a history of alkali ingestion. Majority of them showed relief in response to esophageal dilatation and with low recurrence rates.

Conclusion: Esophageal dilatation with bougies is one of the safest, less invasive, and efficient method for the effective management of esophageal stenosis/ stricture formation after corrosive intake that needs to be emphasized specially in healthcare centers which lack specialized departments dealing with more invasive surgical procedure and facilities.

Keywords: Esophagus, Dilatation, Corrosive, Stricture, Acid, Alkali

INTRODUCTION

Esophagus is described as a muscular tube that connects throat to the stomach and carries the food and liquid. An esophageal stricture can be defined as an abnormal tightening or narrowing of one or more parts of the esophagus. A stricture (narrowing) in the esophagus makes it difficult for food to travel down the tube. In severe cases, even drinking liquids can be very difficult progressively.¹

It is a critical complication of multiple diseases and their underlying etiologies. It needs to be acknowledged, understood completely and that it needs an immediate management protocol. Causes of stricture development may include fibrosis, inflammation or neo-plasia that involves esophagus and mostly damages the surrounding mucosal and/or sub-mucosal surfaces. The esophageal tissue loses its distensible properties and elasticity due to stricture formation. And this may be restricted to some part of esophagus or may be diffused throughout the course of esophagus. Iatrogenic mucosal and/or sub-mucosal injuries leading to stricture formation have become more common now-a-days; due to the increased use of endoscopic techniques in regards to latest diagnostic and treatment modalities.²

A stricture can be either benign or malignant. The key to an appropriate management plan depends upon the identification of its etiology. Most of the esophageal strictures arise as a sequelae of benign gastric strictures which result from chronic gastro-esophageal reflux disease (GERD), that makes almost 70-80% of the cases among adults.³

Apart from poorly-controlled chronic gastro-esophageal reflux disease (GERD), many other etiologies for esophageal stricture formation also exist. But corrosive intake is the leading and most common cause of stricture formation among young children and adolescents.⁴

In this study, we are discussing esophageal strictures caused by corrosive intakes only.

Corrosives are the substances that have potential to cause some irreversible damage to the contact surface or to completely

destroy other substances in contact with them. Corrosives can damage a number of substances, but the word "corrosives" is usually used for the type of chemical substances that can cause chemical burns when a living tissue comes in contact with them. Corrosives may exist as solids, liquids, gases.⁵

Corrosive substances are being used in different types of professional industries to even as a common household item, most commonly existing as a cleaning agent. Most of the drains cleaning agents are either acids and/or are alkalis as they have the potential to dissolve the materials like grease, proteins and mineral deposits on the surfaces such as lime scales inside the water pipes.⁶

Either accidental or intentional ingestion of these corrosive substances results in the tissue damage of mouth, esophagus, stomach and other parts of gastrointestinal tract under the phenomenon of chemical burns injury. As the healing process takes place, the damaged area results in many outcomes; one of which is the stricture formation.

Regarding diagnosis of esophageal strictures due to any etiology, after getting complete medical history and bedside evaluation of the status of the patient, the investigation of choice would be an oesophago-gastro-duodenoscopy (OGD) or CT oesophagogram. Both of them are used as ideal techniques for the diagnosis of gastro-esophageal strictures. X-ray studies of the chest can help in the initial assessment of the critical situations like presence of an impacted foreign body or presence of diaphragmatic hernia. X-ray chest also helps to assess the pulmonary status before moving towards any procedure. A CT scan of neck and thorax is more helpful in this regard after ingestion of some corrosive substance to rule out any gastro-esophageal perforations. Most of the patients are assessed with the help of OGD as it can provide detailed image of gastro-esophageal anatomy and apart from diagnosis, biopsy sampling of the mucosa can also done in OGD, at the same time. Endoscopic techniques also enable us to, simultaneously, go for the dilatation of the strictures as and when indicated. Fluoroscopy remains as the single option for the cases of complex strictures or in the

situations where OGD is incomplete; may be due to drastic decreases in the diameter of that esophageal portion. Endoscopic ultrasound (EUS) is yet another approach for the diagnosis of esophageal strictures.^[2]

In regards to the esophageal strictures, that are benign in nature, dilatation is the key for their management. Although dilatation procedures usually result in partial or complete relief of symptoms of dysphagia, but recurrent strictures do occur in some patients. The novel remedies for such refractory/recurrent strictures include stent placement procedures and/or incisional therapies.^[7]

The principle objective behind this study is the assessment of outcome of esophageal dilatation in patients with esophageal stricture formation due to corrosive intake experienced at a tertiary healthcare facility in order to devise a better management plan for such patients with special emphasis on the importance of esophageal dilatation techniques.

Methodology: In this retrospective type of study conducted at Thoracic Surgery Department of Sheikh Zayed Hospital (R.Y.Khan), a total of 19 subjects who presented with esophageal stricture formation due to corrosive intake were taken as study subjects i.e.

- All the patients with esophageal stricture formations due to corrosive intakes regardless of age, gender, type of ingested corrosive or reason for the corrosive intake, willing to participate in the study were included in this study.
- Patients who didn't give consent for participation and those who had esophageal stricture formation due to any other causes were excluded from this study.

The location of involved mucosa, number of dilatation sessions done, level of symptomatic relief and recurrence rates were assessed for these study subjects. Then the data was gathered and analyzed with the help of SPSS Version. 21. The duration of this study was from January 2018 to June 2021.

RESULTS

This study comprised of 19 patients who had esophageal stricture formed due to corrosive intake and they underwent esophageal dilatation for it. The age range for the subjects came out to be 5-40 years (Mean= 2.89±8.81). Male to female ratio came out to be 7(36.8%) vs 12(63.2%) respectively. Among these subjects, 15(78.9%) subjects gave history of an acid ingestion while only 4(21.1%) had a history of alkali ingestion. The amount of corrosive ingested varied from approximately 10ml to 100ml (Median= 50ml).

Out of these 19 patients, 15(78.9%) patients developed multiple strictures while 4(21.1%) patients had single stricture involving different mucosal sites as shown above in the bar-chart.

As a treatment methodology, esophageal strictures were dilated using mechanical (Bougie) dilators of different sizes passed over guide-wire. Majority of the patients showed complete relief from the symptoms of dysphagia after number of dilatation sittings varying between 1-30 (Median=15) while some showed partial relief only; as described in the bar chart below along with recurrence rate of symptoms of dysphagia.

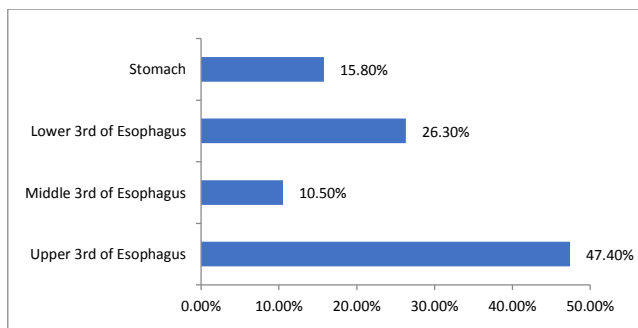


Figure # 01: shows the relative involvement of different segments of GI tract

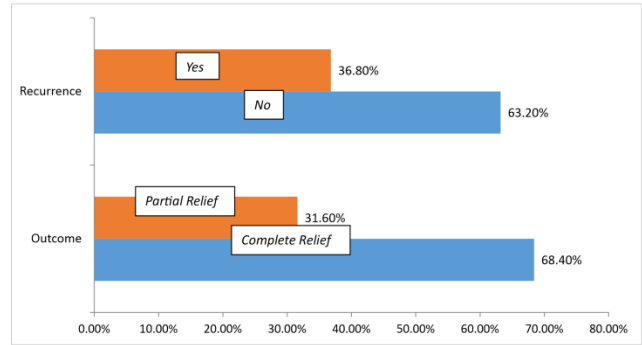


Figure # 02: shows relative outcome & the rate of recurrence among study subjects

DISCUSSION

As we know that there are multiple complications of corrosive intake; stricture formation is one of the most common complications that can be treated with minimally invasive procedure and with a promising results. In our study, we found out that acid ingestion is more common among our study subjects while on the other hand in some studies, strong alkalies are the found more commonly such as NaOH or KOH, which are usually present in disinfectants found at homes or at laundry stations, and in battery fluids. While strong acidic substances which include HCl, H₂SO₄, and H₃PO₄ are used very commonly in bathrooms or swimming pools for the removal of rustic material from surfaces and are also used as fluids in batteries of vehicles. Some studies conclude acids to be less commonly ingested for suicidal purposes as compared to alkalies; which can be explained in context that alkalies cause more severe pain.^[8] This contrast of observation is quite understandable in terms of availability of corrosive materials at different places and in terms of age variation among the patients.

In a study, the most common site of involvement came out to be the upper-third of esophagus then was the middle-third of the esophagus. These results are quite consistent with the results of our study that showed involved of upper-third of esophagus in majority of the study subjects i.e. 19(47.40%).⁹

In terms of outcome of esophageal dilatation for management of stricture formation after corrosive intake, our study concluded that majority of our study subjects i.e. 13(68.4%) got relieved that can be labeled as positive outcome of esophageal dilatation as a management tool for stricture formation after corrosive intake. While another study carried out at a tertiary healthcare center for children in Guangzhou, China came to the conclusion that out of 168 esophageal dilatation procedures performed on patients of esophageal stricture formation after corrosive intake, 26(60.5%) patients were considered as in positive success rate and 17(39.5%) patients failed to get complete relief thus required stent placement and/or surgery.¹⁰

CONCLUSION

Corrosive intake is a serious health issue that requires timely management and long term follow up. Esophageal dilatation with bougies is one of the safest, less invasive, and efficient method for the effective management of esophageal stenosis/ stricture formation after corrosive intake that needs to be emphasized specially in healthcare centers which lack specialized departments dealing with more invasive surgical procedure and facilities.

REFERENCES

1. Esophageal Strictures: Symptoms, Causes & Treatment (clevelandclinic.org)
2. Desai JP, Moustarah F. Esophageal Stricture. [Updated 2021 Jan 10]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK542209/>

3. ASGE Standards of Practice Committee. Pasha SF, Acosta RD, Chandrasekhara V, Chathadi KV, Decker GA, Early DS, Evans JA, Fanelli RD, Fisher DA, Foley KQ, Fonkalsrud L, Hwang JH, Jue TL, Khashab MA, Lightdale JR, Muthusamy VR, Sharaf R, Saltzman JR, Shergill AK, Cash B. The role of endoscopy in the evaluation and management of dysphagia. *Gastrointest Endosc*. 2014 Feb;79(2):191-201. [PubMed]
4. Lamoria S, De A, Agarwal S, Singh Lamba BM, Sharma V. Peptic esophageal stricture in an adolescent with Barrett's esophagus. *Int J Adolesc Med Health*. 2016 Feb 27;29(5) [PubMed]
5. Helmenstine, Anne Marie, Ph.D. "Corrosive Definition in Chemistry." ThoughtCo, Aug. 27, 2020, [thoughtco.com/definition-of-corrosive-604961](https://www.thoughtco.com/definition-of-corrosive-604961).
6. "Drain and Waste systems cleaners". Archived from the original on 2013-02-20. Retrieved 2013-01-01
7. Siersema PD. Treatment options for esophageal strictures. *Nat Clin Pract Gastroenterol Hepatol*. 2008 Mar;5(3):142-52. doi: 10.1038/ncpgasthep1053. Epub 2008 Feb 5. PMID: 18250638.
8. Park, Kyung Sik. "Evaluation and management of caustic injuries from ingestion of Acid or alkaline substances." *Clinical endoscopy* vol. 47,4 (2014): 301-7. doi:10.5946/ce.2014.47.4.301
9. Lee HJ, Lee JH, Seo JM, Lee SK, Choe YH. A single center experience of self-bougienage on stricture recurrence after surgery for corrosive esophageal strictures in children. *Yonsei Med J*. 2010 Mar;51(2):202-5. doi: 10.3349/ymj.2010.51.2.202. Epub 2010 Feb 12. PMID: 20191010; PMCID: PMC2824864.
10. Lan-Lan Geng, Cui-Ping Liang, Pei-Yu Chen, Qiang Wu, Min Yang, Hui-Wen Li, Zhao-Hui Xu, Lu Ren, Hong-Li Wang, Shunxian Cheng, Wan-Fu Xu, Yang Chen, Chao Zhang, Li-Ying Liu, Ding-You Li, Si-Tang Gong, "Long-Term Outcomes of Caustic Esophageal Stricture with Endoscopic Balloon Dilatation in Chinese Children", *Gastroenterology Research and Practice*, vol. 2018, Article ID 8352756, 6 pages, 2018. <https://doi.org/10.1155/2018/8352756>