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CASE REPORT

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Caustic esophageal stenosis: A case report of endoscopic dilatation with nasogastric tubes

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Abstract

The management of the esophageal strictures that may result from caustic ingestion has evolved over time, from surgical to endoscopic management. Dilation with nasogastric tubes may be a valuable alternative in places with limited resources.

KEYWORDS

barium swallow, caustic ingestion, esophagogastroduodenoscopy, nasogastric tubes, pediatrics

1 | INTRODUCTION

Management of esophageal strictures has evolved over time. We describe a case of a 14-month-old male with esophageal strictures from caustic ingestion. Endoscopy was performed, and the strictures were dilated with nasogastric tubes. This case demonstrates that dilatation of esophageal strictures using nasogastric tubes is safe, cheap, and reliable.

Ingestion of corrosive substances remains an important public health problem mostly in developing countries. Social and economic variables and lack of prevention has led to increases in these injuries.[1] Caustic ingestion typically refers to the ingestion of strongly alkaline (pH >11.5) or acidic (pH <2) household or industrial cleaning products. Ingestion of caustic substances may cause burns to the cheeks, mouth, oropharynx, esophagus, stomach, and sometimes the duodenum.[2] Acid ingestion is more common in Europe and Asia, whereas alkali ingestion is more common in Africa, Oceania, and the Americas.[2,3] Acids cause an eschar of burnt tissue from coagulation necrosis. Alkaline agents destroy proteins and fats and destroy the cellular architecture through liquefactive necrosis. Tissue destruction with alkali ingestion continues through the mucosa to muscular layers until the alkali is neutralized.[1,2,4]

The most frequent and serious long-term complication from the ingestion of caustic substances is severe esophageal stenosis and/or strictures. The management of esophageal strictures has evolved, and development of endoscopic techniques has led to more conservative management, rather than more aggressive surgical procedures. Endoscopic dilation (with balloon or bougienage) is the most widely used technique.[2,5] In endoscopic dilatation of esophageal strictures, balloon or wire-guided bougie dilators are used to perform esophageal dilatation. However, these balloons or wire-guided bougie dilators are often scarce in developing countries and adapted pediatric devices are usually lacking. Also, bougienage dilatations in the pediatric population are rarely reported due to the fear of exerting further axial shearing forces on a stenotic esophagus.[6] We describe a non-conventional technique of endoscopic dilation using nasogastric tubes in a 14-month-old child.

2 | CLINICAL CASE

A previously healthy 14-month-old male presented to the nutritional rehabilitation unit with a history of progressive weight loss and difficulty in swallowing for 1 month. Initially, the patient had difficulty in swallowing solid

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foods only, but gradually developed difficulty in swallowing liquids. There was also a history of regurgitation and vomiting of feeds. The above symptoms started following accidental ingestion of an unspecified quantity of caustic liquid at home. The mother noted drooling of saliva continuously for the last 1 week prior to the hospital visit. There was no complaint of painful swallowing or history of ingestion of a foreign body.

On physical examination, the patient was sick-looking, moderately wasted and dehydrated, and afebrile with an axillary temperature of 37.1°C. There was no pallor, jaundice, edema, or lymphadenopathy. Body weight was 8.0 kg, and the mid-upper arm circumference was 11.5 cm (normal >13.5 cm). Complete blood count was within normal limits. A diagnosis of non-edematous severe acute malnutrition was made and appropriate treatment with intravenous fluids and nutritional consultation was initiated.

A barium swallow was obtained to determine the possible cause of the dysphagia. It showed two tight strictures of the upper and middle esophagus (Figure 1).

An upper gastrointestinal (GI) endoscopy was planned. The endoscopy was performed under general anesthesia. A standard Olympus adult endoscope (10 mm diameter) was used. The endoscope was advanced to about 7 cm from the incisors where there was noted to be a stricture. This was dilated easily with the endoscope. The endoscope was further advanced to about 12 cm from the incisors where there was noted to be a tight stricture (Figure 2). Under direct visualization, this stricture was serially dilated with a 10 French nasogastric tube, and it was dilated again with 16 French nasogastric tube (Figure 3). Subsequently, the endoscope was able to pass to the distal esophagus (Figure 4).

Postoperatively, the patient was prescribed a proton pump inhibitor and allowed to start feeding 24 h after the endoscopy. Due to financial constraints, the patient did not return for follow-up.

3 | DISCUSSION

Ingestion of caustic substances and its long-term effect on the GI system maintain its place as an important public health issue despite the multiple efforts to educate the public and contain its growing number. This is due to the readily available presence of these caustic agents as items of household use and loose regulatory control on its production. According to the American Association of Poison Control (AAPC), household cleaning substances made up over 11% of all chemical exposures in children under the age of five in the United States from 2010 to 2020.[7] Cases of caustic ingestion in Africa are largely underreported.[5]

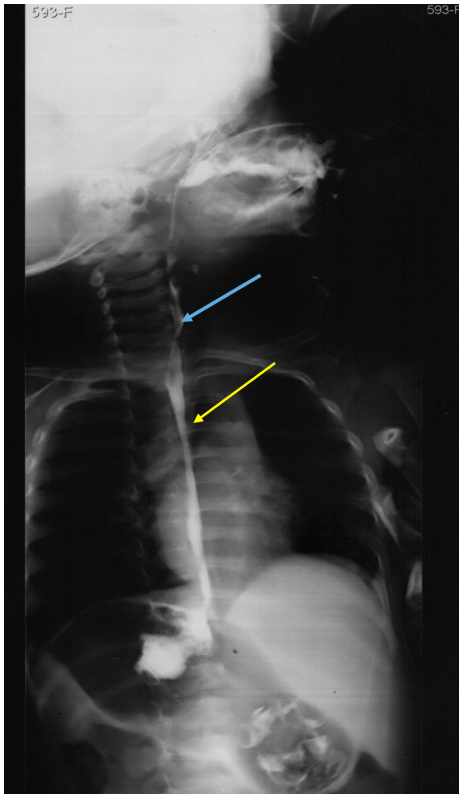

FIGURE 1 Barium esophagram demonstrating an upper (blue arrow) and middle esophageal (yellow arrow) stricture.

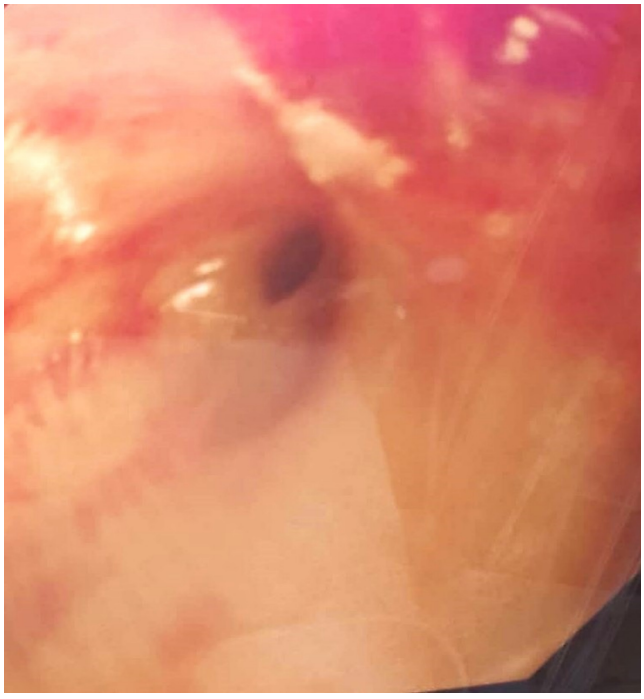

FIGURE 2 Endoscopic view of the mid-esophageal stricture with surrounding edema and erythema of the mucosa.

The age of occurrence for caustic ingestion presents in a bimodal fashion. The first peak is in the 1– 5-year-old age group. Toddlers are most at risk. Children are more likely

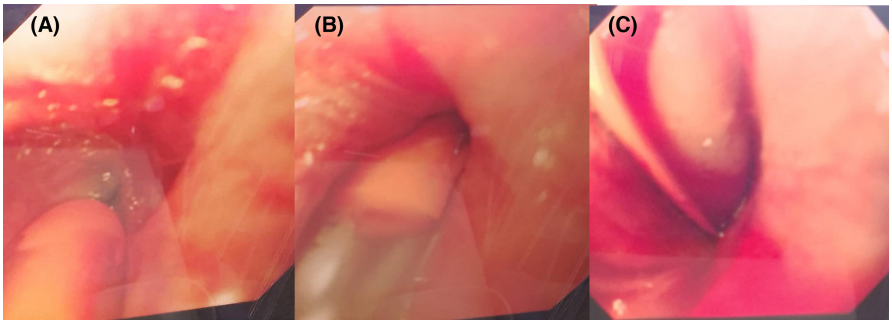

FIGURE 3 (A) Dilation of the esophagus with a 10 French nasogastric tube. (B) Serial dilation of the esophagus with a 10 French nasogastric tube. (C) Further dilation with a 16 French nasogastric tube.

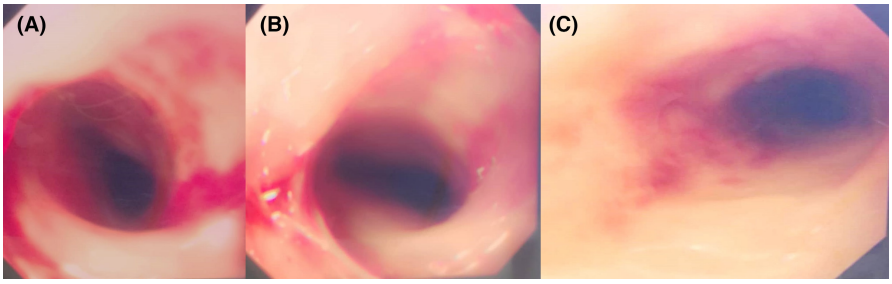

FIGURE 4 (A) Endoscopic view of the esophagus after dilation with the 16 French nasogastric tube, with bleeding noted. (B) More distal view after serial dilation. (C) Endoscopic view of the distal esophagus after completed dilation.

to ingest caustic substances either accidentally or out of curiosity. Mortality is rare because children often spit out the corrosive material immediately. The second peak is in the adolescent and young adult (21 years and older) age group. Majority of ingestions in this age group are intentional suicide attempts resulting in a greater and more extensive injury.[2,8–11] Cases of caustic ingestion in children over the age of 5 years should raise an index of suspicion.[2] Given our patient's age, their ingestion was likely accidental.

The clinical presentation of caustic ingestion is diverse and does not always correlate with the degree of injury. Symptoms depend on the location of damage. Hoarseness and stridor are signs that are highly suggestive of upper respiratory tract involvement, particularly the epiglottis and larynx. The presence of these findings may signal a potentially life-threatening respiratory event. Fever, chest pain, peritonitis, or hypotension are concerning for visceral perforation. Dysphagia, odynophagia, and drooling are more specific for an esophageal injury.[1,4] Hematemesis or epigastric pain is concerning for gastric involvement.[1,12] The severity of the lesions depends on the type, quantity, duration of contact, and concentration of the caustic substance ingested. Acute complications include mucosal injuries, perforations, fistulae, mediastinitis, and peritonitis, while long-term complications include esophageal stricture, pyloric stenosis, and esophageal squamous cell carcinoma.[13] Our patient presented with an esophageal stricture approximately 1 month after the initial ingestion.

In the acute management of caustic injuries, neutralizing agents should not be administered due to the additional thermal injury and chemical destruction of tissues these reactions produce. Vomiting should not be induced to avoid reexposure to the caustic substance.[4] Routine nasogastric intubation in the acute setting to remove any remaining caustic material is no longer warranted because of the risk of infection which may delay mucosal healing.[14]

Upper GI endoscopy is considered the foundation in the diagnosis and management of caustic ingestions. Zargar's classification is the most used to describe mucosal injury of the esophagus as demonstrated in Table 1.[14] Zargar et al found that early major complications and death were confined to patients with Grade III injuries. All patients with Grade 0, I, and IIA injuries recovered without sequelae. Majority of grade IIB and all survivors with Grade III injuries eventually developed esophageal or gastric scarring. The degree of esophageal injury at endoscopy is a predictor of systemic complications and death with a 9-fold increase in morbidity and mortality for every increase in injury grade.[15] Our patient presented with a Grade I mucosal injury.

The primary non-surgical treatment of caustic esophageal stricture is endoscopic dilatation. This can be achieved with Bougies or balloon dilators. For tight and fibrotic strictures, bougie dilators are often more reliable than balloon dilators.[16] For either technique, the goal is to achieve relief of symptoms and to maintain an efficient luminal diameter of at least 15 mm.[17] It is generally recommended to continue weekly dilations as long as progress is being made. The frequency is reduced once the preferred luminal diameter is achieved.[2] In our case, bougie and balloon dilators are not readily available and are cost prohibitive for our patient population. We recommend dilation with nasogastric tubes in situations in which there may be limited resources.

TABLE 1 Zargar classification and its corresponding endoscopic description.

Zargar classification	Description
Grade 0	Normal mucosa
Grade I	Edema and erythema of the mucosa
Grade IIA	Hemorrhage, erosions, blisters, superficial ulcers
Grade IIB	Circumferential lesions
Grade IIIA	Focal deep gray or brownish-black ulcers
Grade IIIB	Extensive deep gray or brownish-black ulcers
Grade IV	Perforation

Though endoscopic dilatation with balloon dilators has been the standard of care for benign esophageal strictures, the recurrence rate still reaches up to 40%.[18] Stents play a valuable role in this patient population. Three types of stents are now available: self-expanding metal stents, self-expanding plastic stents, and biodegradable stents. To date, there is still no ideal stent recommended for universal use among patients with benign esophageal strictures, therefore the choice for each patient should be individualized.[4,18] Surgical intervention is indicated in severe cases of esophageal strictures where endoscopic therapy fails or where there is evidence of perforation. Surgical options include partial or total esophagectomy with gastric pull-through or colonic interposition.[2,5]

Gastric acid suppression with H_2-receptor blockers or proton pump inhibitors have become routine practice to allow faster mucosal healing and to prevent stress ulcers.[2] In the setting of caustic ingestion with corrosive esophagitis, sucralfate is said to hasten mucosal healing by providing a physical barrier between the harmful effects of the corrosive substance and the gastroesophageal mucosa.[14,19] The use of corticosteroids is controversial. Multiple studies have shown that corticosteroid administration does not provide any benefit in preventing stricture development.[1,2] Intralesional steroid injections such as triamcinolone have long been suggested to prevent strictures. However, the optimal dose and frequency have not been validated.[1,14] Routine use of antibiotics is also controversial.[1,2,14] Mitomycin C has been shown to decrease the rate of caustic stricture formation in animal studies and has been used as an adjunct in humans after stricture dilatation.[1,2,4,14]

4 | CONCLUSION

Ingestion of caustic substances and its long-term effect on the gastrointestinal system maintain its place as an important public health issue despite the multiple efforts to educate the public and contain its growing number. Follow-up in a patient with a clear history of accidental ingestion of a caustic substance requires prompt and thorough management to assess for late complications. This case highlights that endoscopic dilatation of esophageal strictures using nasogastric tubes, yet to be reported in the literature, is a safe, cheap, reliable, and successful method. Alternative methods of management with dilatation are imperative in developing countries with limited resources.

AUTHOR CONTRIBUTIONS

Esau Ogei: Conceptualization; writing – original draft. **Jackson Kakooza:** Conceptualization; writing – original draft. **Catherine R Lewis:** Conceptualization; formal analysis; methodology; writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

CONSENT

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

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REFERENCES

1. Contini S, Scarpignato C. Caustic injury of the upper gastrointestinal tract: comprehensive review. *World J Gastroenterol*. 2013;19(25):3918-3930. doi:10.3748/wjg.v19.i25.3918
2. Arnold M, Numanoglu A. Caustic ingestion in children—a review. *Semin Pediatr Surg*. 2017;26(2):95-104. doi:10.1053/j.sempedsurg.2017.02.002
3. Rafeey M, Ghojazadeh M, Mehdizadeh A, Hazrati H, Vahedi L. Intercontinental comparison of caustic ingestion in children. *Korean J Pediatr*. 2015;58(12):491-500. doi:10.3345/kjp.2015.58.12.491
4. Millar AJW, Cox SG. Caustic injury of the oesophagus. *Pediatr Surg Int*. 2015;31(2):111-121. doi:10.1007/s00383-014-3642-3

5. Mantho P, Engbang JP, Ndzana Awono CD, et al. Caustic esophageal strictures in children: diagnosis, treatment and evolution in the city of Douala. *J Surg Res (Houst)*. 2022;5(3):486-493. doi:10.26502/jsr.10020248
6. Reinders A, van Wyk MJ. Fluoroscopic guided benign oesophageal stricture dilatation in children: 12 years' experience. *S Afr J Child Health*. 2014;8(3):96-100. doi:10.7196/SAJCH.695
7. Gummin DD, Mowry JB, Beuhler MC, et al. 2020 annual report of the American association of poison control centers' National Poison Data System (NPDS): 38th annual report. *Clin Toxicol*. 2021;59(12):1282-1501. doi:10.1080/15563650.2021.1989785
8. Satar S, Topal M, Kozaci N. Ingestion of caustic substances by adults. *Am J Ther*. 2004;11(4):258-261. doi:10.1097/01.mjt.0000104487.93653.a2
9. Lupa M, Magne J, Guarisco JL, Amedee R. Update on the diagnosis and treatment of caustic ingestion. *Ochsner J*. 2009;9(2):54-59.
10. Abbas A, Brar TS, Zori A, Estores DS. Role of early endoscopic evaluation in decreasing morbidity, mortality, and cost after caustic ingestion: a retrospective nationwide database analysis. *Dis Esophagus*. 2017;30(6):1-11. doi:10.1093/dote/dox010
11. Ekpe EE, Ette V. Morbidity and mortality of caustic ingestion in rural children: experience in a new cardiothoracic surgery unit in Nigeria. *ISRN Pediatr*. 2012;2012:1-4. doi:10.5402/2012/210632
12. Park KS. Evaluation and management of caustic injuries from ingestion of acid or alkaline substances. *Clin Endosc*. 2014;47(4):301-307. doi:10.5946/ce.2014.47.4.301
13. Assal A, Saloojee N, Dhaliwal H. Esophageal stricture due to magnesium citrate powder ingestion: a unique case. *Can J Gastroenterol Hepatol*. 2014;28(11):585-586. doi:10.1155/2014/504698
14. DeLusong MAA, Timbol ABG, Tuazon DJS. Management of esophageal caustic injury. *World J Gastrointest Pharmacol Ther*. 2017;8(2):90-98. doi:10.4292/wjgpt.v8.i2.90
15. Ali Zargar S, Kochhar R, Mehta S, Kumar MS. The role of fiberoptic endoscopy in the management of corrosive ingestion and modified endoscopic classification of burns. *Gastrointest Endosc*. 1991;37(2):165-169. doi:10.1016/S0016-5107(91)70678-0
16. Katz A, Kluger Y. Caustic material ingestion injuries—paradigm shift in diagnosis and treatment. *Health Care Curr Rev*. 2015;3(2):152-155. doi:10.4172/2375-4273.1000152
17. Broor SL, Raju GS, Bose PP, et al. Long term results of endoscopic dilatation for corrosive oesophageal strictures. *Gut*. 1993;34(11):1498-1501. doi:10.1136/gut.34.11.1498
18. Ham YH, Kim GH. Plastic and biodegradable stents for complex and refractory benign esophageal strictures. *Clin Endosc*. 2014;47(4):295-300. doi:10.5946/ce.2014.47.4.295
19. Gümürdülü Y, Karakoç E, Kara B, Taşdoğan BE, Parsak CK, Sakman G. The efficiency of sucralfate in corrosive esophagitis: a randomized, prospective study. *Turk J Gastroenterol*. 2010;21(1):7-11.

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