Original Article

Managing Oesophageal Caustic Injury in a Resource-constrained Environment: A National Cohort Study

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Abstract

Introduction: Injury to the oesophagus due to ingestion of caustic substances is a common reason for presentation to paediatric surgical services worldwide. We report the experience of managing these injuries in a resource-constrained environment. **Methods:** All patients presenting to specialist paediatric surgical services in The Gambia following ingestion of a caustic substance over 11 months (December 2021–November 2022) were identified and invited for surgical assessment including contrast swallow, endoscopy under general anaesthetic and oesophageal dilatation where indicated. Those who attended formed the study cohort. Data collected included age, time since caustic ingestion, oral intake using the International Dysphagia Diet Standardisation Initiative (IDDSI) dysphagia score, treatment given and outcome. **Results:** Twenty-five patients presented in the 11 months, of these, 12 attended for further assessment and formed the study cohort. Of the 13 who did not, one is known to have died (cause unknown) and the remainder is lost to follow-up. Median age was 4.5 years (range: 2–14 years); duration from injury was 7 months (2–144). The median IDDSI score at the presentation was 4 (0–6). Nine children underwent oesophageal dilatation with a median improvement in IDDSI score of 2 (0–3). **Conclusion:** Caustic injury of the oesophagus is a common presentation in The Gambia. Accessing specialist surgical care is challenging for patients. Oesophageal dilatation is feasible in most cases and has the potential to significantly improve oral intake. More severe cases not amenable to dilatation pose a significant challenge. A public health approach to try and prevent oesophageal injuries from occurring is needed.

Keywords: Caustic, low- and middle-income countries, oesophagus, stricture

Introduction

Injury to the oesophagus due to ingestion of a caustic substance is a common presentation to paediatric surgical services worldwide.[1] Typically, the worst injuries are seen with ingestion of strongly alkaline agents due to their ability to cause deep, tissue-penetrating burns.[2] This can lead to oesophageal perforation in the acute phase and oesophageal scarring and stricturing in the longer term. The sequelae can be devastating, such as enterovascular fistulation,[3] or more chronic leading to feeding difficulties and malnutrition.[4,5] The management of these injuries occurs in three stages: stopping ongoing damage and keeping the child safe through the acute phase, deploying secondary preventive measures to reduce scarring such as mitomycin and dealing with the long-term consequences of the injury for example: dilating strictures, managing reflux and occasionally performing reconstructive surgery.[6]

These injuries are more prevalent in low- and middle-income countries, largely due to an absence of the safety features seen in higher-income settings such as childproof containers.[7,8] For example, bulk containers of caustic substances used in cleaning are decanted at the point of sale into reused and unlabelled containers such as drink bottles that are attractive to young children. The situation in low-income countries is compounded by a variety of systemic factors including a lack of recognition of the dangers, difficulty accessing healthcare facilities leading to delays in presentation, the non-availability of secondary preventive measures and inadequate infrastructure to allow the effective treatment of long-term conditions.[9] The optimum

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approach to caustic injuries and where to prioritise any efforts to reduce the impact of these injuries in a low-income setting remains unclear.

The Gambia is located on the West Coast of Africa; it is the smallest mainland country in Africa, with a population of approximately 2.5 million, of whom over half are children. It is ranked 172 of 189 countries in terms of human development and is listed as one of the United Nations 'Least Developed Countries'.[10] There is only one qualified paediatric surgeon in the country and only one tertiary care provider. We report a national cohort of children in The Gambia with caustic injury of the oesophagus and their management.

Methods

All children under the age of 18 years presenting to the tertiary paediatric surgical service in The Gambia over 11 months (December 2021–November 2022) were identified prospectively and invited for surgical assessment and treatment. Children who attended for this assessment formed the study cohort.

Data collected were age, gender, substance ingested, time to first presentation, previous treatment given, oral intake using the International Dysphagia Diet Standardisation Initiative (IDDSI) dysphagia score, contrast swallow findings and appearances at endoscopy under general anaesthetic. The IDDSI score grades consistencies of oral intake from 0 to 7 where 0 is a thin liquid and 7 represents fully chewable foods. A score of 5 or more indicates the ability to eat food without the need for mechanical blending and a score of 6 or 7 indicates normal oral intake.[11] Oesophageal dilatation was carried out under the same anaesthetic where indicated and feasible using pressure-calibrated dilatation balloons. The IDDSI score was repeated at follow-up.

Data are reported as median (range), and statistical analysis was undertaken using Prism 9.0 (GraphPad, La Jolla, USA).

Results

Twenty-five children presented in the 11-month study period. Of these, 12 attended for further assessment and examination under general anaesthetic and formed the study cohort. Of the 13 who presented initially and did not reattend, one is known to have died, cause unknown. There is no further information available for the remainder.

The cohort who attended are summarised in Table 1. Of the 12 (6 boys) who did attend, the median age was 4.5 years (2–14 years). The duration from injury to assessment was 7 months (2–144 months). Where known, the substance ingested was caustic soda (9), in three, the substance was unknown or the ingestion event was unrecalled. None of the cohort had received secondary preventive treatment such

Table 1: Summary of patients and their findings and treatment

Gender	Age (years)	Time from injury (months)	Prior surgical treatment	IDDSI score at presentation	Fluoroscopy findings	Endoscopic findings	Treatment given	IDDS score at follow-up
Male	4	2	None	4	Tight upper narrowing with possible distal narrowing	Stricture at 12 cm	Dilated to 12.5 mm	6
Male	7	9	Gastrostomy	3	No narrowing	Easily negotiated	None	3
Female	8	6	Gastrostomy	3	Long mid-oesophageal stricture with proximal dilatation	Strictures at 12 and 20 cm	Dilated to 15 mm	6
Male	13	2	Gastrostomy	0	Unable to tolerate	Impassable narrowing at 15 cm	None	0
Female	2	4	None	6	Possible distal stricture	No stricture seen	None	6
Male	3	Unknown	None	3	Mid oesophageal narrowing	Passable stricture at 14 cm	Dilated to 12 mm	5
Female	5	20	Gastrostomy, dilatations in Germany	0	Long, narrow stricture	Common orifice to trachea and oesophagus, unable to negotiate	Dilated to 6 mm	0
Male	2	4	None	4	Mid oesophageal narrowing	Passable stricture at 13 cm	Dilated to 12.5 mm	6
Female	3	8	None	4	Upper oesophageal narrowing	Impassable stricture at 12.5 cm	Dilated to 10 mm	7
Female	3	8	None	4	Tight narrowing upper oesophagus	Impassable stricture at 12 cm	Dilated to 9 mm	6
Female	5	36	Gastric pull-up and feeding jejunostomy	5	Anastomotic stricture	Narrow anastomosis	Dilated to 20 mm, feeding tube removed	7
Male	14	144	Gastrostomy	4	Narrowing mid oesophagus	Stricture at 18 cm	Dilated to 15 mm	6

IDDSI: International Dysphagia Diet Standardisation Initiative

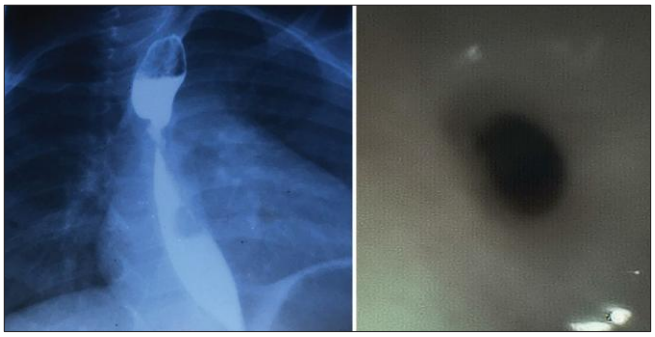


Figure 1: Image from barium swallow showing tight mid-oesophageal stricture and the same stricture at endoscopy

as mitomycin. Six children had accessed surgical treatment before this presentation, four had a gastrostomy fashioned but no further treatment, one had been taken abroad to Europe where a gastrostomy had been fashioned and a single oesophageal dilatation carried out, the sixth had received care in a neighbouring African country and undergone a partial gastric pull up with an oesophagogastric anastomosis in the lower thorax and fashioning of a feeding jejunostomy.

All had an attempt at a barium swallow contrast examination, one was not able to take any contrast so no images were obtained. One child had a relatively normal examination. The remainder all had significant oesophageal strictures [Figure 1]. These were mostly in the upper (3) or mid (4) oesophagus. One had extensive stricturing most of the length of the oesophagus, one had a mild distal oesophageal stricture and the child who had undergone previous surgery had a tight anastomotic stricture. The radiological findings were all confirmed at endoscopy [Figure 1] with the exception of one girl with extensive oropharyngeal scarring in whom it was not possible to enter the oesophagus. Nine of 12 children underwent balloon dilatation of their oesophageal stricture. Two had no significant narrowing on endoscopy and the remaining child had no oesophageal lumen that could be entered with the balloon.

Figure 2 shows the IDDSI scores before and after treatment. The median IDDSI score at the presentation was 4 (0–6). A score of 4 equates to the ability to tolerate pureed food only. Two of the children in the cohort could not even tolerate their own saliva and were spitting up constantly. Following treatment, the IDDSI score improved by 2 points to a median of 6 (0–7) (P = 0.0011, Wilcoxon Pairs Signed-Rank). After intervention, nine of 12 children were able to tolerate a normal or near normal diet (IDDSI >5) compared to only two at presentation. No complications of endoscopy or dilatation occurred.

Discussion

We present a national cohort of children in a low-income African country with oesophageal injury following caustic ingestion. There were significant delays in access to surgical attention and over half of children presenting with caustic ingestion did not attend planned follow-up appointments.

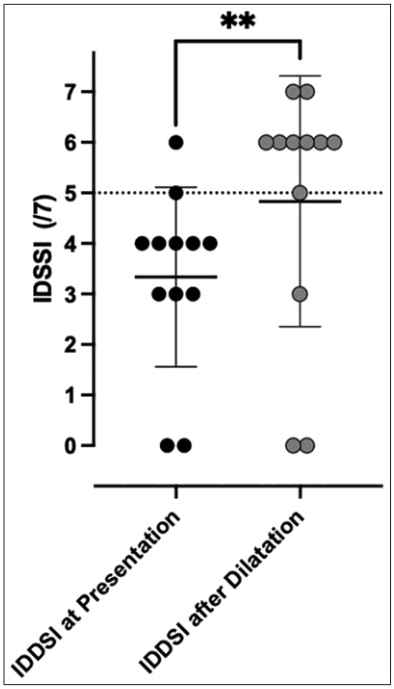


Figure 2: International Dysphagia Diet Standardisation Initiative scores before and after treatment (**P = 0.0011)

Prior surgical treatment in The Gambia had been limited to gastrostomy formation. No children had received secondary preventive treatments such as mitomycin. There was significant improvement in the dysphagia score for the majority following a single oesophageal dilatation.

Although the numbers included in our cohort appear small, they are from a country of <2.5 million population and over a time of less than a year. Our series is the latest of several cohorts reported of children with caustic injury presenting in Africa. Other authors have described not dissimilar numbers to ours with 50 children over 3 years in recent report from Nigeria[12] and 60 in South Africa over 6 years in a much older study.[13] This demonstrates that the problem of caustic injuries is pervasive across the continent with little sign of changing with time.

Access to medical services remains an issue in sub-Saharan Africa, shown in our low follow-up rate with fewer than half of the children affected by caustic injury attending for follow-up, a situation described by other authors working in similar circumstances.[8] In those that do attend, the median time from injury to treatment was over 6 months, after the period, in which secondary preventive measures to reduce strictures can be given.[14] This only leaves managing the long-term sequelae as an option. Dilating strictures is the mainstay of this,[1] especially while reconstructive surgery remains generally unavailable in The Gambia, in common with most low-and middle-income countries.[15] No patients in our cohort have proceeded to reconstructive surgery although there are centres in sub-Saharan Africa performing major reconstructive surgery following caustic ingestion with good

results.[4] We have demonstrated significant and clinically meaningful improvements in oral intake for the majority of children following just one dilatation. It remains to be seen how sustained this improvement will be in the long term, however, and serial dilatations will be a challenge in the context of the resources available to the health system in The Gambia.

In the context of constrained resources and difficulty accessing medical care, we can only agree with other authors that a preventive approach must be the priority in addressing the issue of caustic ingestion injuries.[4,5] A legislative approach is unlikely to have a significant impact but a public health information campaign that raises awareness of the dangers of caustic substances, particularly cleaning products, and encourages families to keep them out of reach of children has the potential to reduce these injuries occurring. Other authors in similar environments to The Gambia have made the same recommendation[16] and similar campaigns related to other health issues have had a positive impact in The Gambia in the recent past.[17] In the meantime, for children living with the effects of caustic ingestion, ensuring nutrition should be the primary goal, with oesophageal dilatations to allow oral intake where possible. Children with more extensive oesophageal damage, not amenable to dilatation, face a very uncertain future until reconstructive surgery can be made more widely available across all resource environments.

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Conflicts of interest

There are no conflicts of interest.

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