Post-corrosive Esophageal Stricture in a 3-Year-Old with Successful Esophageal Replacement Surgery

Cleopas Mutua Kaumbulu¹ Awori Mark Nelson², Rohini Patil¹, Ahmed Mohamed Rafik², James Ndung’u Muturi²

1. Gertrude's Children's Hospital
2. Kenyatta National Hospital

Correspondence to: Dr. Kaumbulu Cleopas, P.O Box 34 Muthaiga Rd, Nairobi 42325 - 00100. Email: cleomutua@gmail.com

Summary
Accidental caustic ingestion in children though entirely preventable, continues to be present in developing countries. The gastrointestinal injuries following caustic ingestion in children ranges from mild to fatal in nature. Presentation of such children to the medical facility could be early or sometimes late with complications. Management is based on the type of injury and could range between medical conservative management to complex surgical procedures. Such complex surgeries are almost unavailable in developing countries. We present a 3-year-old, who presented to our facility with an esophageal stricture following accidental caustic ingestion four months prior to presentation.

Introduction
Accidental caustic ingestion in children is a worldwide problem [1], but most of them are unreported and do not show the true incidence of the condition [2]. Wide ranges of gastrointestinal injuries are caused following the ingestion of caustic substances, the degree of which depends on the nature, concentration and quantity of the caustic ingestion. Esophageal stricture is one the complications in children who present late. These strictures are managed by endoscopic dilatation with balloon or using rigid savary bougies. If that fails, surgery in the form of esophageal replacement using stomach or colonic interposition should be considered. The mortality and morbidity following surgery are low in expert hands [3]. Late reconstructive surgeries in children with a reportable good outcome are very rare in developing countries.

Case Report
A 3-year-old boy was suspected to have swallowed corrosive substance four months prior to admission. Following the consumption, he was irritable and had increased secretions and coughing. He had been admitted twice in a local medical facility, where he was stabilized and treated for the oral sores with intravenous fluids and antibiotics. A chest x ray done at that point was unremarkable. Endoscopy showed erosions of the oesophagus and the stomach. Upon discharge he developed progressive dysphagia. He was started on proton pump inhibitors for 2 weeks with no improvement. A barium swallow done showed features suggestive of spastic esophagitis. A repeat barium swallow three months later showed features of post corrosive esophagitis with a tight esophageal stricture 7cm along distal esophagus. The child was referred to our facility and underwent esophageal dilatation, following which he developed esophageal rupture. The child had increasing respiratory distress by now. A chest x-ray showed subcutaneous emphysema in the neck and pneumomediastinum and bilateral pleural effusion (figure 1). The barium studies confirmed features suggestive of esophageal rupture (figure 2). By then, the child needed oxygen via nasal prongs and inotropes to support the blood pressures. Considering the general condition of the patient, the decision was made for esophageal diversion surgery and gastrotomy. A left

© 2019 Author. This work is licensed under the Creative Commons Attribution 4.0 International License.
cervical end esophagostomy was performed and the esophagogastric junction was banded twice with 6-mm nylon tape at the time the gastrostomy tube was inserted. The child tolerated the procedure well and was stabilized in the intensive care unit. Feeds were initiated through gastrostomy and the child was subsequently discharged.

Three months later the child was reviewed in readiness for esophageal replacement using colon as a conduit. Preoperative bowel preparation was done. Under general anesthesia, the cervical esphagostomy was mobilized via old neck incision (figure 3), through a laparotomy. Ascending, transverse and descending colon were mobilized (figure 4); most of the transverse colon and distal 4 cm of ascending colon was used as conduit (figure 5) on a left colonic artery pedicle and retro sternal space developed bluntly from above and below (figure 6). The closed end of colon delivered into neck (isoperistaltic) via retrosternal space, esophagus spatulated along anterior border then anastomosed end-to-side to posterior aspect of colon (figure 7).

---

**Figure 1. Chest x-ray after esophageal dilatation showing air in the mediastinum**

**Figure 2. Barium studies showing features of esophageal rupture**

**Figure 3. Esophageal diversion surgery**

**Figure 4. Choosing colon for conduit**

**Figure 5: Measuring length of colon for conduit**
Nasogastric tube was passed into stomach and secured, without changing the gastrostomy site. The child was again received at the intensive care unit intubated.

Feeds were initiated through the nasogastric tube initially as continuous feeds then slowly changed to bolus feeds. Later the nasogastric tube was removed and the boy was allowed to feed orally and was discharged. The child’s progress was followed-up four months after the surgery. He was feeding and growing well. He will be kept under regular follow-up.

Discussion

The incidence of accidental caustic ingestion in children in developing countries is high because prevention is lacking. The problem is largely unreported in these settings [2]. The average age of children in Africa was 3.07±2.02 years (range, 1.8–5.4 years), males (0.91%) and 19 females (0.23%) with (F/M ratio, 0.25). In Africa, of children exposed to caustic substances, 33% of accidents were caused by alkaline agents and 33% by acidic agents [4]. Acids cause coagulation necrosis, with eschar formation that may limit substance penetration and injury depth. Alkalis combine with tissue proteins and cause liquefactive necrosis and saponification, and penetrate deeper into tissues, causing extensive tissue damage. The degree of a corrosive lesion depends on the nature, concentration, and quantity of the caustic ingestion. Determining the severity of damage following caustic substance ingestion is one of the most important initial steps for treatment and for preventing complication. The symptoms may not ascertain the severity of the injury. Early manifestations are nausea, abdominal pain, vomiting, and dyspnea. Later manifestations include fever, tachycardia, tachypnea, and dysphasia. The presence of three or more symptoms is an important predictor of severe esophageal lesions [5]. In children, 18% to 46% of all caustic ingestions are associated with esophageal burns. The incidence of coexistent gastric injury in the literature ranges from 20% to as high as 62.5% [6]. Esophageal stricture is considered a short-term effect, but esophageal perforation, esophageal obstruction and cancer could be some of the long-term effects of ingestion of caustic agents. In the initial management, laboratory studies like total white cell counts and C reactive proteins are more useful in monitoring and guiding patient management. Shortly after ingestion, a plain chest radiograph may reveal pneumomediastinum, suggesting esophageal perforation, as well as free air under the diaphragm, indicating gastric perforation. Hypaque or gastrografin studies are better options to confirm the above. A computerized tomography scan likely offers a more detailed evaluation than early endoscopy about the transmural damage of esophageal and gastric walls and the extent of necrosis [7]. Endoscopy is important in the management of caustic ingestion. Every child with suspected caustic ingestion and symptoms/signs (any oral lesions, vomiting, drooling, dysphagia, hematemesis, dyspnea, abdominal pain, etc.) should have an endoscopy within 24 hours of ingestion to identify all the consequent digestive tract lesions. The risk of severe damage increases proportionally with the number of signs and symptoms and an endoscopy is always mandatory in symptomatic patients. It can be withheld if the child is asymptomatic and if adequate follow-up is assured. Findings on endoscopy are graded as follows:
Grade 0 – indicates a normal mucosa
Grade 1 – indicates only slight swelling and redness of the mucosa
Grade 2A – indicates the presence of superficial ulcers, bleeding, and exudate
Grade 2B – indicates local or encircling deep ulceration
Grade 3A – indicates focal necrosis
Grade 3B – indicates extensive necrosis.
Most patients with grade 1 or 2A injuries have good prognosis [8].

In the medical line of management, the role of steroids was controversial. Different steroids (dexamethasone, prednisolone, methylprednisolone) were used at different doses and through different routes of administration (oral, intravenous) from 7 days to 4–6 weeks in children with corrosive esophagitis. High dose methylprednisolone used for the management of grade 2B esophageal burns may reduce stricture development [9]. Intraloesional steroid injections increase efficacy of bougie dilation and decrease the requirement for repetition of bougie dilatation [10].

The administration of broad-spectrum antibiotics is usually advised mainly if corticosteroids are initiated, as well as if lung involvement is identified.

Mitomycin C, a chemotherapeutic agent with DNA crosslinking activity, when injected or applied topically to the esophageal mucosa, significantly reduced the number of dilatation sessions needed to alleviate dysphagia in patients with caustic esophageal strictures. However, long-term follow-up is needed to prove its efficacy and to evaluate potential long-term side effects [11].

Surgical intervention is indicated when attempted dilatation either causes esophageal perforation or fails to relieve stenosis. As esophageal strictures caused by corrosive injury are usually long, dilatation often is unsuccessful and some form of esophageal replacement surgery will be required. When surgery is indicated, the best solution is usually emergent (or urgent) external diversion of the esophagus via a cervical stoma (esophagostomy), and the insertion of a gastrostomy tube for feeding. Attempts to repair perforations or replace the esophagus at this time are ill advised as the patient usually is not in an optimal condition. With esophageal diversion, a useful procedure, particularly in sick patients, is to band (tie-off) the gastro-esophageal junction (twice) with 3-mm nylon tape (as opposed to transecting it). The tape is tied tight enough to occlude the esophageal lumen but not to totally occlude blood supply to the esophageal wall.

With esophageal replacement, several alternatives are available that offer the chance of a good quality of life for a prolonged period; none, however, are as good as the native esophagus. Replacement surgery should be performed once a patient’s nutritional status has returned to normal (at least 3 months after starting gastrostomy feeds). Replacement conduits can be fashioned from the stomach, colon or jejunum. Available evidence shows that both gastric (that uses the whole stomach) and colonic conduits are the most favoured (12). Colonic conduits are more complex to fashion than gastric conduits but have less reflux. In addition, colonic conduits occupy less space in the chest than gastric conduits and so are associated with less respiratory complications. Thus, the colon is considered the optimal conduit (12). It may be placed retrosternally or in the posterior mediastinum. It is usually placed in an isoperistaltic orientation and an anti-reflux procedure is not generally indicated when it is placed retrosternally. We normally place a nasogastric tube intraoperatively and aim to retain the feeding gastrostomy for 3 months postoperatively (we remove it once we are satisfied with the quality of swallowing). In the immediate postoperative period, we do not feed the patient for 7 days, and then we perform a water-soluble contrast study on day 8. If there is no leak, we commence oral feed. Cervical leak is quite common in the immediate postoperative period; most leaks are small and will heal spontaneously (12). We keep the patient ‘nil per oral’ until cervical leaks are healed but we do feed the patient through the gastrostomy tube. We keep the nasogastric tube in situ until the cervical leak has healed.

### Table 1. Studies on esophageal replacement in Africa

<table>
<thead>
<tr>
<th>Authors</th>
<th>Country</th>
<th>Sample size</th>
<th>Children in sample size</th>
<th>Conduit</th>
<th>No. of replacement operations in the study</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. Munkonge</td>
<td>Zambia</td>
<td>205</td>
<td>172</td>
<td>Transverse colon</td>
<td>32</td>
</tr>
<tr>
<td>Saula PW et al</td>
<td>Kenya</td>
<td>1</td>
<td>1</td>
<td>Reversed gastric tube</td>
<td>1</td>
</tr>
<tr>
<td>Missoki Azanlidi BOUME, et al</td>
<td>Togo</td>
<td>18</td>
<td>18</td>
<td>Gastric tube</td>
<td>1</td>
</tr>
</tbody>
</table>

In conclusion, esophageal replacement offers a robust solution to dysphasia resulting from caustic injury to the esophagus. The procedure can be performed with a
relatively low risk of early mortality. The isoperistaltic colon is probably the best choice of conduit in children.

Acknowledgement
To Gertrude’s Hospital intensive care unit, theatre team, and radiology and pathology departments.

References