

Original Article

Pattern of Esophageal Injuries and Surgical Management: A Retrospective Review

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ABSTRACT

Background: The consequence of significant injury to the esophagus is devastating. The initial management when timely and appropriate is rewarding and often prevents lethal complications. The objective of this study is to describe the etiology of esophageal injury in our institution, the management procedures and the mid-term results. **Method:** Consecutive patients diagnosed and managed for esophageal injury from January 2005 to March 2015 were retrospectively reviewed. **Results:** One hundred and eleven patients were seen and treated during this period; 85 (76.6%) predominantly children were corrosive esophageal injuries who accidentally ingested caustic soda and 26 (24.4%) were traumatic esophageal injuries. Patients with corrosive esophageal injuries were predominantly male (2:1), mean age 12.8 ± 14.2 years (2–58 years) and predominantly children (53% ≤ 5 years; 18.8% ≥ 18 years). Patients with non-corrosive esophageal injury were also predominantly male (4:1) with a mean age of 34.4 ± 20.1 years (1–73 years). The treatment procedures for corrosive esophageal injuries included esophagocoloplasty 64 (75.3%), colopharyngoplasty 10 (11.8%), colon-flap augmentation pharyngo-esophagoplasty 4 (4.7%), colopharyngoplasty with tracheostomy 4 (4.7%) and esophagoscopy and dilatation 3 (3.5%). Mortality was 5.9% and 5 patients were lost to follow-up. In patients with noncorrosive esophageal injury, esophageal perforation from instrumentation accounted for 14 (53.9%), foreign body impaction 11 (42.3%) and spontaneous perforation 1 (3.8%) making up the rest. Management of these patients included esophagotomy and removal of foreign body 7 (26.9%), esophagectomy, cervical esophagostomy and feeding gastrostomy 10 (38.6%), primary repair 7 (26.9%), Ivor Lewis procedure 1 (3.8%) and emergency esophagectomy with colon replacement 1 (3.8%). Mortality in this group of patients was 7.7% and 4 patients were lost to follow-up. **Conclusion:** Corrosive esophageal injuries were the most frequent form of esophageal injury at our center due to unrestricted access to corrosive substances. Generally, appropriate surgical intervention in patients with esophageal injury based on individualization of care yields excellent early and mid-term results.

KEYWORDS: Colon-flap, colopharyngoplasty, esophageal injury, pharyngoesophagoplasty

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INTRODUCTION

Injury to the esophagus can produce a reversible or an irreversible damage depending on the etiology and severity of the injury. The etiology could be from trauma or tissue destruction secondary to swallowing

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a caustic substance. Trauma could be direct from penetrating or blunt injuries, impacted foreign bodies or from iatrogenic causes.^[1] Spontaneous rupture of the esophagus is an equally devastating injury and is rare.^[1]

The esophagus is a fibromuscular tube extending from the sixth cervical vertebrae to the 12th thoracic vertebrae. It is divided into cervical, thoracic and an abdominal segments. The thoracic and abdominal esophageal segments are less exposed compared to the cervical esophagus and this accounts for the rarity of direct esophageal injuries from penetrating and blunt chest injuries in these segments. Direct procedures involving the esophagus especially rigid esophagoscopies for diagnostic and therapeutic purposes is the most common cause of esophageal trauma in current literature.^[2] Symptoms of esophageal injury presented by a patient depend on the segment injured especially if there is perforation and extravasation of esophageal contents. Cervical and abdominal esophageal injuries are often diagnosed early because the symptoms are overt and most practitioners institute early management protocols which lower morbidity and mortality. Thoracic esophageal injuries, however, are diagnosed late with devastating consequences. This is due to the hidden nature of the injury coupled with insidious symptoms.

The esophagus may be exposed to deadly corrosive substances with devastating results. They may be ingested intentionally or unintentionally, and these substances ingested, may cause partial or complete necrosis of the wall of the esophagus and sometimes with perforation. Patients who survive are left with damaged esophagus for life and are unable to swallow satisfactorily. If nothing is done to help create an alternate route for food to get into the stomach, starvation and severe malnutrition may lead to death.

Management of patients with esophageal injury can be very challenging irrespective of the cause of injury, and this involves repairing the damaged esophagus or creating a new conduit to enable the patient to feed.

The aim of this study is to describe the etiology of esophageal injuries, the management including the operative procedures used and the midterm results.

METHODS

The medical records of all patients who presented at the National Cardiothoracic Center, Korle Bu Teaching Hospital with esophageal injury and treated from January 2005 to March 2015 were retrospectively reviewed. The data included the age, sex, cause of esophageal injury, management procedures, complications after surgery and the outcome. The analysis for means, median,

frequencies, standard deviation and interquartile range was performed using Microsoft excel 2016 statistics software.

The permission to present this data was first sought from the head of the institution when it was first presented during the Focus Session: Joint Session EACTS – PASCATS – Cardiothoracic Surgery at the 29th EACTS Annual Meeting in October 2015 in Amsterdam. The Ethics committee of the College of Health Sciences is aware of the write up and from my discussion with them, they did not see the need for a formal approval since it was already presented.

RESULTS

One hundred and eleven patients were included in the study; 85 (76.6%) presented with complications of corrosive injury and 26 (24.4%) presented with non-corrosive esophageal injury. Patients with non-corrosive esophageal injury were predominantly male (4:1) with a mean age of 34.4 ± 20.1 years (1–73 years). The median age was 33.5 years with an interquartile range of 31 years. The most frequent cause of esophageal trauma was from instrumentation (rigid esophagoscopy) 14 (53.9%) followed by foreign body impaction 11 (42.3%) Table 1. These patients were managed by employing the following measures: esophagotomy and removal of foreign body 7 (26.9%), esophagectomy, cervical esophagostomy and feeding gastrostomy 10 (38.6%), primary repair 7 (26.9%), Ivor Lewis procedure 1 (3.8%) and emergency esophagectomy and colon replacement 1 (3.8%). Patients who had esophagectomy, cervical esophagostomy and feeding gastrostomy underwent esophageal replacement with the left colon 2–3 months later. There were two (7.7%) early deaths. Operative survivors were routinely followed up at 2 weeks, 1 month, 3 months, 6 months, and then annually thereafter. Four patients (15.4%) were lost to follow-up. The functional success of the remaining 20 patients was excellent with no instances of dysphagia.

Eighty-five patients presented with corrosive esophageal injuries. They were predominantly male (2:1), mean

Table 1: Etiology of traumatic esophageal injury

Aetiology of traumatic oesophageal injury		
Aetiology	Frequency	Percentage (%)
Oesophageal perforation from instrumentation	14	53.9
Impacted denture	8	30.8
Other impacted foreign body	3	11.5
Spontaneous perforation	1	3.8
Total	26	100

age 12.8 ± 14.2 years (2 – 58 years) and predominantly children (53% ≤ 5 years; 18.8% ≥ 18 years). The median age was 5 years with an interquartile range of 9 years. Except for four who ingested battery acid with suicidal intent, 69 (81.2%) patients accidentally ingested caustic soda. Following evaluation by barium swallow and esophagoscopy, 67 (78.8%) patients had esophageal stricture without pharyngeal involvement; 18 (21.7%) had severe pharyngoesophageal strictures. The treatment procedures for these included esophagocoloplasty 64 (75.3%), colopharyngoplasty 10 (11.8%), colon-flap augmentation pharyngoesophagoplasty 4 (4.7%), colopharyngoplasty with tracheostomy 4 (4.7%) and oesophagoscopy and dilatation 3 (3.5%). The left colon was used as a conduit in 81 (95.3%) patients. Functional success after 6 months follow-up was excellent without dysphagia in survivors. Early complications occurred in 14 (17.1%) patients and included salivary fistula, 11; colo-colic anastomosis leak, 2; graft necrosis, 1. There were five (5.9%) late complications; colo-esophageal anastomotic stenosis, 3; thoracic inlet compression, 1; reflux with nocturnal regurgitation, 1. Two (2.4%) early and three (3.7%) late mortalities were observed. Five (5.9%) patients were lost to follow-up. The follow-up protocol was similar for patients with non-corrosive injuries.

DISCUSSION

Injury to the esophagus irrespective of the cause of injury is intolerable and life threatening and demands appropriate and timely intervention to yield desirable results. There were no traumatic esophageal injuries due to penetrating or blunt mechanisms during the period of the study. In most studies they are considered to be rare.^[3] Most traumatic esophageal injuries are iatrogenic following instrumentation.^[4] This is reflected in this study accounting for 53.9% of the traumatic esophageal injuries. The patients in our study had rigid esophagoscopy. The most common cause of non-iatrogenic traumatic esophageal injury is foreign body impaction which together accounted for 42.3% of the total cases managed. Majority of them presented with impacted swallowed dentures. These patients have history of months to years of having swallowed accidentally their denture. They went to see their general practitioner initially and were told to watch for the denture in their stool. They ended up watching for the denture in their stool for months until they develop dysphagia. Any benign process that may obstruct and induce inflammation and fibrotic change of the esophagus can produce esophageal stricture.^[5] Education of doctors to refer such patients for immediate removal of the denture will prevent late presentation and

esophageal destruction. There was only one case of spontaneous esophageal perforation. However, in a study, spontaneous esophageal rupture was the most common cause of esophageal perforation followed by foreign bodies.^[2] This data was from a developed country where lifestyle may influence the high incidence of spontaneous esophageal perforation.

The management of traumatic esophageal injuries especially when perforation occurs is contingent on the location of the injury, degree of the injury, clinical status of the patient, time of the injury, and diagnosis.^[6] The diagnosis of traumatic cervical or abdominal esophageal injury is easier when compared with thoracic esophageal injury because clinical signs occur earlier in the former two injuries. The late diagnosis of thoracic esophageal injury is a contributing factor to the poor prognosis witnessed in this category of patients. The most frequent procedure performed during the period of this study was esophagectomy, cervical esophagostomy, and feeding gastrostomy (38.6%). Ninety percent of these patients presented late with intrathoracic esophageal perforation. After three months, colon was used to substitute for the esophagus. An emergency colon bypass with colopharyngoplasty was done in a 54-year-old man who presented with an impacted fish bone in the hypopharynx with necrotizing retropharyngeal abscess involving the proximal esophagus. After thorough debridement, it was impossible to exteriorize the stump left for drainage. This patient had tracheostomy while on the ventilator. He was weaned off the ventilator after 10 days but died 2 days afterwards from tracheostomy related complications. Primary repair was carried out in some of the esophageal perforations even though they presented more than 24 hours after injury. These patients were more stable and had favorable intraoperative findings that permitted primary repair. This is supported by a review article where it was observed that primary repair is the optimal procedure, if possible, even when diagnosis is delayed for more than 24 hours.^[7]

The patient who benefited from Ivor Lewis procedure presented with a long-standing impacted denture complicated with stricture at the distal esophagus. Twenty out of the 26 patients are doing well and are satisfied with their swallowing. The mortality for this cohort of 26 patients was 7.7%. The first was the 54-year-old man already described and the second patient was a 60-year-old man who presented late with a thoracic esophageal perforation after chest tube insertion. He went through surgery—esophagectomy, cervical esophagostomy, and feeding gastrostomy but succumbed to the overwhelming sepsis 2 days after the surgery.

Eighty-five patients presented at our center with various degrees of severity of corrosive esophageal strictures. These patients were initially managed at a periphery hospital and referred to the center with dysphagia secondary to esophageal stricture. They were predominantly children who ingested caustic soda accidentally. In developing countries like Ghana, caustic soda is sold in the open market with no legislative instruments to regulate the concentrations sold. They are mostly sold in the granulated form that looks like sugar. As part of improving the livelihood of women from very poor communities, they are trained to manufacture soap locally using caustic soda as one of the ingredients. Unfortunately, the solutions prepared from the granulated soda for soap making are sometimes left carelessly in familiar containers and innocent children either from the same household or from the neighborhood mistakenly ingest them as water. These were observed in a study by Botwe *et al.*^[8] In addition, lackadaisical attitudes and noncompliance with good practices on the part of traditional soap makers are contributory to this menace. These children present with different degrees of severe esophageal and pharyngoesophageal injuries. Following evaluation using barium studies and esophagoscopy, 67 (78.8%) of the patients had esophageal stricture without pharyngeal involvement. Majority of these patients 64 (75.3%) had colo-oesophagoplasty; the left colon was used as the conduit. Three (3.5%) had esophagoscopy and dilatation. These were short segment esophageal strictures and responded to single dilatation favorably.

Patients with severe pharyngoesophageal strictures were 18 (21.7%). Most of these patients could not undergo barium studies because they could not swallow at all. Naso gastric tubes were employed in a few of them to introduce the barium. From the commentary of Victor Ferraris on the treatment of caustic esophageal injury, caustic ingestion that cause severe pharyngeal injury requiring colopharyngoplasty are among the most debilitating injuries with the poorest long-term results.^[9] Colopharyngoplasty was carried out in 10 (11.8%) of the patients. A colon-flap augmentation pharyngoesophagoplasty was carried out in some selected patients who had incomplete but severe stricture of the pharynx and the hypopharynx. The aim of this procedure is to augment the residual esophageal lumen and the pharynx with colon and help restore near normal pharyngeal and hypopharyngeal space.^[10] These patients tend to swallow without significant aspiration within days after the surgery. According to the World Society of Emergency Surgery guidelines 2015, temporary tracheostomy is mandatory during the rehabilitation training period after colopharyngoplasty.^[11] Tracheostomy

was not needed in this cohort of our patients when it was not required before surgery. Four patients suffered laryngeal stricture and had permanent tracheostomy before surgery. Three of them died from tracheostomy related complications after surgery. The left colon pedicled on the left colic artery was used as the conduit in 81 (95.3%) patients.

The functional success after 6 months was excellent with no significant dysphagia (grade 0) in survivors. Early complications occurred in 14 patients and these included salivary fistula in 11 patients, 2 patients with colo-colic anastomotic leak, and one case of graft necrosis. Cervical esophagostomy and feeding gastrostomy were immediately carried out for the child who developed graft necrosis. The stomach was used as the conduit after 2 months of recovery. There were two (2.4%) immediate mortalities. One was due to leakage and sepsis and the other tracheostomy related. Three late mortalities occurred and two were tracheostomy related and one was sudden death at home. The cause of death was not known. After discharge from hospital, patients were routinely reviewed after 2 weeks, one month, 3 months, 6 months, and then annually or biennially thereafter. The median follow-up was 4 years (6 months to 10 years). Five patients were lost to follow-up. For the 75 patients, functional outcome was 100%.

We conclude that although corrosive esophageal injuries are rare in the developed world, they are the most important form of esophageal injury in Ghana with unrestricted access to corrosive substances. The majority of victims are young children, 5 years of age or younger. Urgent legislative measures are required to control access to corrosive substances as a means of primary prevention in developing nations. Iatrogenic traumatic esophageal injury remains the most common traumatic esophageal injury. Surgical intervention and choice of a procedure in patients with esophageal injury or trauma should be based on individual assessment and in our setting the early and mid-term results are good.

What is already known on the topic:

- Most traumatic oesophageal injuries are iatrogenic.
- Temporary tracheostomy is mandatory after colopharyngoplasty.

What this study adds:

- Information about the pattern of oesophageal injuries in the West African sub-region.
- Management of severe pharyngoesophageal strictures without tracheostomy with good outcome.

Study limitations

Limitations of this study include its retrospective nature. In addition, the sample size from the group with traumatic esophageal injury is not large enough to draw definitive conclusions regarding optimum management. This is especially the case with the esophageal perforation. Although the number lost to follow (five) is acceptable, the exclusion of their outcomes may have biased the results.

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Nil.

Conflicts of interest

There are no conflicts of interest.

Authors Contribution

Mark Tetty- conception of study, acquisition of data, drafting of article, final review of article; Frank Edwin – drafting of article, read through final report; Ernest Aniteye – drafting of article, final review of article; Martin Tamatey - drafting of article, final review of article, Kow Entsua-Mensah – acquisition of data, final review of article, Kofi Baffoe Gyan – acquisition of data, final review of article; Innocent Adzamli – acquisition of data and final review of article.

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