Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/q8tgrx05

NON-SURGICAL MANAGEMENT FOR LATE ESOPHAGEAL PERFORATION IN CHILDREN

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Abstract

Background: Even today, esophageal perforation remains a lethal medical condition with a high rate of morbidity and mortality. We encountered numerous pediatric cases of esophageal perforation that presented in late time. This study examined vigorous conservative approaches to get the maximum benefit from forceful pleural contamination irrigation without taking them to surgery.

Methods: Between 2013 and 2020, 21 patients who had esophageal perforations that were discovered 24 hours after the event were treated. Perforations were found in the esophageal parts of the neck, thorax, and abdomen. The causes of perforation were traumatic in 3 cases, post-corrosive in 6 cases and iatrogenic in 12 cases

Results: Conservative treatment was provided to each of the twenty one patients. There was only one death record (4.8%) in a post-corrosive perforation case. Twenty out of twenty-one patients (95.2%) are survived without undergoing surgery. Only one case required surgery because the abdominal portion of the esophagus had developed a perforation**.**

Conclusions: Effective treatment of sepsis with a chest drain and irrigation, together with the placement of a nasogastric tube for feeding, reduces mortality, avoids potential peri-operative complications, and improves the likelihood of esophageal healing. Esophageal perforation remains a well-known devastating complication, with higher death rates in late presented cases. A number of studies recommended an aggressive surgical strategy to manage this issue, such as vigorous surgical drainage, primary esophageal resection, 2-stage resection and/or esophagostomy, or primary surgical repair. We discovered that extensive conservative treatment might produce superior results than documented surgical cases.

Introduction

Esophageal perforation is seen as a catastrophic complication and is associated with 20–30% death rate despite of improving in the management plans (1). The presence of mediastinitis is the reason for the increased mortality rate in those cases. The patient is more likely to have a late presentation and a higher risk of death due to the inaccessibility of the esophagus. Before the invention of antibiotics, the surgical intervention played a role in treating esophageal perforations (2). The frequency of upper gastrointestinal endoscopic operations has led to an increase in the rate of esophageal perforation in recent decades. The development of mediastinitis can be prevented with

an early diagnosis. The good news is that children hardly get esophageal perforations during upper gastrointestinal endoscopy (3). The conservative care of esophageal perforations was first defined by Mengoli and Klasser (4), and it has since been a recognized option, particularly for tiny localized perforations. Patients were categorized into low-, intermediate-, and high-risk groups with varying morbidity and mortality outcomes using the Pittsburgh Esophageal Perforation Scoring System (PSS), which was thought to highlight the importance of esophageal perforation (5). We used the PSS to treat conservatively children with late diagnosed esophageal perforations at our tertiary center. The purpose of the study was to evaluate the conservative management results in various situations.

Methodology

We enrolled 21 patients with late esophageal perforation. All of those patients were admitted and managed at Assiut university hospitals from 2013 to 2020. The mean age of the study cases was 8.5 years (ranging between 2 and 15 years). There were 6 girls and 15 boys. This study included patients with late presenting esophageal perforations (detected after 24 hours of the perforation time) and associated with pleural collections; all cases were referred from other remote hospitals; 12 patients (57.1%), had iatrogenic esophageal perforation following endoscopic maneuvers; four patients (19%) experienced trauma-related perforation; and five patients (23.8%) had post-corrosive esophageal perforation.

The diagnosis was delayed 24 hours after the time of perforation. High-grade fever (over 38.5°C) was present in all cases. Six patients (28.6%) had back pain. There were 3 patients (14.3%) with surgical neck emphysema and 10 patients (47.6%) who came with shock. Chest X-ray revealed right-sided pleural effusion in 18 cases (85.7%), left-sided pleural effusion in 3 cases (14.3%) and 2 case (9.5%) had a pneumoperitoneum. All patients had CT esophagography to confirm the perforation. Eighteen patients (85.7%) had thoracic esophageal perforations, while three patients (14.3%) had cervical perforations. Two patients (9.5%) had abdominal esophageal perforations, which were identified by upright abdominal x-ray, abdominal ultrasonography beside CT esophagography.

We used the Pittsburgh Esophageal Perforation Scoring System (PSS) which is a clinical score determined by clinical symptoms, laboratory and radiological workup. It depends on pointing system (1–3 points for each item) for a potential 18-points total score. Each item is assigned points based on the following scale:

- Tachycardia (>100 beat per minute), Age (over 75 years old), Leukocytosis (>10,000 white blood cells/mL), or pleural effusion (on radiological workup): each item receive one point.

- Fever (>38.5C), non-contained leak (on radiological workup), respiratory dysfunction (respiratory rate > 30, increasing oxygen requirement, or need for mechanical ventilation), or delayed diagnosis >24 hours: each item receive two points.

- Hypotension or cancer: each item receives three points.

Based on this clinical scale, we enrolled all cases in high risk group because all of them collected 5 points or above and usually are associated with the worst prognosis (5). Table (1)

The conservative care approach for this esophageal perforation consists of inserting a chest tube, irrigating the pleural area every eight hours with a warm povidone-iodine solution 1:20 diluted with saline, and inserting a nasogastric tube (NGT). The benefit of inserting a chest tube was to allow the pleural collection and purulent fluid that had developed into empyema to be drained from the leaking esophagus. Warm povidone-iodine solution was used to clean the pleural spaces in order to treat mediastinitis induced by esophageal-gastric contents contamination. We used silicone Foley catheters in all patients as a nasogastric tube to inflate its balloon as a gastric balloon. From the first

day of admission, we used a nasogastric tube for enteral feeding rather than total parenteral nutrition, unless there were obvious abdominal perforations. Medical treatment (IV proton pump inhibitors) and inflating of the gastric balloon of the NGT below the gastro-esophageal junction were used to manage gastro-esophageal reflux. Intravenous broad spectrum antibiotics (vancomycin, gentamycin, and metronidaloze) were administered to all patients. Respiratory physiotherapy was a part of management protocol for all cases. Analgesics were prescribed when necessary. A CT esophagography was used as a follow-up tool to assess the healing progress of esophageal perforation. Two patients only required an urgent laparotomy because they had abdominal collections, and one of them passed away from septic shock within 6 hours after the procedure (Table 2).

Results

Twenty out of the twenty-one patients (95.2%) survived through this conservative treatment plan, and their perforations healed. One patient died (4.8%) following a corrosive thoracic esophageal perforation. A laparotomy was performed for this patient after two weeks of admission due to development of delayed gastric perforation (by routine abdominal ultrasound follow-up). He passed away from postoperative septic shock. Another patient (4.8%) had a successful exploratory laparotomy because of presence of esophageal perforation in the abdomen (Table 2). The median hospital stay was 22 days, with a range of 15 to 46 days. Two patients had lung abscesses, which were resolved on medical treatment. The development of esophagocutaneous fistula occurred in two cases.

Discussion

Most of authors have chosen the surgical interventions for treating esophageal perforations that occur early, but the debate over conservative versus surgical treatment for iatrogenic perforations will never be resolved. Surgery was firstly the method of choice as conservative management was always dangerous before the antibiotic use (7).

A research work proved that zero % of mortality in many cases of children which were managed by aggressive conservative treatment (8). There was only one patient had esophageal stricture underwent repeated esophageal dilatation. Those results outline the value of non-operative treatment for children. Long standing post-perforation esophageal strictures mostly underwent resection anastomosis and colonic interpositions (9). Development of and esophago-cutaneous fistula, as a complication of delayed presented esophageal perforations, could be managed successfully by aggressive conservative approach in children. Some authors said that conservative management in this condition is relatively contraindicated (10).

Another research work examined 47 patients with esophageal perforation and mentioned that the sepsis treatment and pleural collections drainage treats the main reason of death and decrease the incidence of esophageal resection which it lets the esophagus to be healed (11). Some authors advised conservative treatment in certain circumstances where surgery was considered to have a higher risk of morbidity and mortality (4). Numerous researches have indicated that the management approach for children with esophageal perforations is moving toward conservative plan. However, there shouldn't be any distal obstruction or extensive contamination from a defect or poor nutritional status. In the event of a severe clinical state, which is typically associated with a delayed diagnosis of esophageal perforation, surgery is required (1, 10).

According to prior studies, the goal here is the management of late presenting esophageal perforation in children by conservative approach as mentioned before. The challenge here was to treat those cases that were admitted in poor clinical condition because they had mediastinitis. The advantage of this approach is eliminating the complications of the surgery in those late cases.

Regardless of the etiology of the perforation, those cases of late diagnosis have an impact on the prognosis (12).
In our research work of conservative management, just one patient (4.8%) passed away out of the 21 patients. This three-year-old boy passed away as a result of septic shock and a post-corrosive gastric perforation. In other research works, a mortality rate of 4.8% is considered acceptable when compared to other treatment plans. Therefore, regardless of the origin or location, we advise aggressive conservative treatment as a first choice in children, with the exception of obvious abdominal perforation, as mentioned by Mishra et al. (10). As Vogel et al. and others have said, it is not only advised for demonstrated local mediastinal extravasation (7, 13, 14).

Compared to total parenteral nutrition (TPN), we provide enteral feeding via a nasogastric tube, which offers our patients several benefits, including fewer infectious complications, lower costs, shorter hospital stays, better overall health, and the ability to heal (15). In this trial, nasogastric tube insertion was used in place of surgical feeding gastrostomy and jejunostomy (16). In this manner, we avoided the potential complications of surgical procedures, prevented retrograde soiling of the mediastinum with gastric secretions using an inflated gastric balloon, and offered complete nutritional support.

Nasogastric drainage was recommended by many authors as a way to avoid mediastinal contamination (17). Others suggested that it worsens mediastinal contamination and promotes gastro-esophageal reflux (10, 18, 19). In our approach, in addition to proton pump inhibitors, we advise distal gastric balloon inflation and gastric drainage under the gastro-esophageal junction to control reflux and lower the risk of gut contents contaminating the mediastinal space. In addition to broad-spectrum antibiotics, irrigation of the pleura with an antiseptic solution heals mediastinitis locally when the mediastinum and pleura become contaminated with food and gastric contents.
Endoscopy may provide as an additional diagnostic and potential treatment option for those ccases (14). Stents are not currently part of our treatment for managing esophageal perforations; further research is needed to determine how best to use this procedure. Despite their encouraging results, some novel approaches to management, such as endoscopically placed clips and endoscopic vacuum sponge, still require further trials (20).

The study has limitations because of its small sample size, which highlights one of its weaknesses (21). Based on our limited experience, conservative treatment for esophageal perforation in children with delayed diagnosis produces better results than emergency surgery, which has been associated with increased mortality rates, according to other researches. Furthermore, we can say that conservative therapy of esophageal perforations can result in healing even in cases of distal stricture; hence, emergency resections are not necessary in those conditions.

Conclusion

This study supported conservative treatment for a small group of children with late-diagnosed esophageal perforations, which produced better results than the documented series involving surgical treatment. This rule does not apply to cases of abdominal perforation, which are a major indicator that surgery is necessary immediately. The most dangerous aspect of this issue is the delay in diagnosis and treatment. Broad antibiotic coverage, good nutritional support through the nasogastric tube without the need for a gastrostomy, jejunostomy, or TPN, topical antiseptic irrigation through chest tubes to drain esophageal leaks, and gastric balloon isolation to isolate the esophagus are all ways to do this. Future research should take into account a larger sample size in order to improve assessment and judgment.

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Tables

Table (1): Patients' categories

					Causes			Locations		
Characters	**Patients number**	**Male**	**Female**	**Mean of Age**	**Iatrogenic**	**Traumatic**	**Corrosive**	**Cervical**	**Thoracic**	**Abdominal**
Study number	**21**	**15**	**6**	**8.5**	**12 (57%)**	**4 (19%)**	**5 (24%)**	**3**	**18**	**2**
Group (1) "PSS≤2"	**0**	**0**	**0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Group (2) "PSS=3-5"	**0**	**0**	**0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Group (3) "PSS>2"	**21**	**15**	**6**	**8.5**	**12 (57%)**	**4 (19%)**	**5 (24%)**	**3**	**18**	**2**

PSS= Pittsburgh Esophageal Perforation Scoring System

Table (2): Study mortality and morbidity:

	Lung abscess	**Esophagocutaneous fistula**	**Total Morbidity**	**Total Mortality**
Patients number	**2**	**2**	**4**	**1**
Percentage	**9.5%**	**9.5%**	**19%**	**4.8%**