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Nonoperative management of esophageal perforations in the newborn



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ABSTRACT

Background: Esophageal perforation in neonates occurs most often in cases of extreme prematurity and is commonly due to iatrogenic causes. Treatment over recent decades has become more conservative. The purpose of this study was to review cases of esophageal perforation in neonates and to describe the presentation, management, and outcomes.

Materials and methods: A retrospective chart review was performed for patients with International Classification of Diseases, Ninth Revision code for esophageal perforation treated at our institution between the years 2009 and 2015. Data collected included demographic information, etiology of perforation (specifically focusing on cases secondary to orogastric tube placement), treatment course, time to resumption of enteral feeds, length of antibiotic use, time to subsequent radiographic resolution, and mortality.

Results: Twenty-five patients met study criteria. The average post-conceptual age at time of diagnosis was 26.5 ± 2.3 wk. All 25 patients were managed nonoperatively with bowel rest, parenteral nutrition, and broad-spectrum antibiotics. Enteral feeds were resumed after a median of 8 d (interquartile range [IQR]: 7-11), the median antibiotic duration was 7 d (IQR: 7-10), and the median time to follow-up esophagram was 7 d (IQR: 7-10). Overall, 24 of 25 patients (96%) demonstrated radiological resolution of perforation on initial follow-up esophagram. Four patients died during the study period, but no deaths were related to the diagnosis of esophageal perforation.

Conclusions: In this largest reported sample of neonates treated for esophageal perforation, nonoperative management with bowel rest, parenteral nutrition, and antibiotics was successful.

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Introduction

Esophageal perforation in neonates most often occurs in cases of extreme prematurity.^{1,2} The most common etiology is iatrogenic secondary to instrumentation during orogastric tube (OGT) placement or oropharyngeal intubation.^{1,2} In addition,

there have been cases of perforation reported after esophagoscopy with dilation for esophageal atresia, rigid esophagoscopy for foreign body retrieval,³ and transesophageal echocardiography before cardiac surgery.⁴

The clinical presentation of esophageal perforation often depends on the time lapse between the injury onset and

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treatment. Signs and symptoms can include fever, tachycardia, respiratory distress, mediastinitis, or frank sepsis with hemodynamic instability. Mortality has been reported to be as high as 29%.³ The management of esophageal perforation was previously aggressive, including surgical debridement, chest tube drainage, or, rarely, repair with an intercostal muscle flap.⁵ Over the last several decades, the pendulum has swung toward conservative management with *nil per os* (NPO), parenteral nutrition (TPN), and antibiotics.^{1,3,6} Data on the outcomes of neonatal esophageal perforation managed nonoperatively are limited.

The aim of this study was to describe the treatment and outcomes of neonatal esophageal neonatal perforation in the era of nonoperative management with a specific focus on cases due to OGT placement.

Materials and methods

Approval was obtained from the Nationwide Children's Hospital Institutional Review Board (IRB14-00724). The hospital database was queried for the International Classification of Diseases, Ninth Revision code for esophageal perforation (530.4). International Classification of Diseases, Ninth Revision codes for injury to the esophagus with and without open wound into cavity (862.21 and 862.22) were also queried. Electronic records for these patients were reviewed to verify diagnosis of perforation. Only cases where esophageal perforation was verified by radiography were included. Charts were reviewed for demographics, etiology of perforation (specifically perforation secondary to OGT placement), comorbidities, and treatment. Information specific to treatment course was collected including nonoperative versus operative management, length of antibiotic use, days to radiographic imaging showing healing of perforation, number of images required to demonstrate healing, days to initiation of enteral feeds, and additional interventions needed. Demographic data, such as post-conceptual age and weight, were reported as average \pm standard deviation. Length of antibiotics, days to radiographic imaging, and days to enteral feeds were reported as medians with interquartile range.

Results

Twenty-nine patients were identified from 2009 to 2015. Of the initial 29, four patients were excluded. Two patients experienced perforation due to dilation of esophageal stricture and thus did not meet the case definition for perforation secondary to OGT placement. Two additional patients were excluded from analysis due to confounding factors related to their esophageal perforation. These patients had a primary surgical diagnosis for their perforation at the time of presentation. The first patient experienced an iatrogenic injury that occurred during operative repair of a congenital diaphragmatic hernia. This was repaired immediately. The second patient suffered nonaccidental trauma to the posterior oropharynx. This patient presented in sepsis and was taken to the operating room on presentation. Although the exact time of the trauma could not be ascertained, the best estimate was that it was greater

than 24 h given the large amount of pus drained from a retroesophageal abscess and the necrotic debris encountered in the wound. The area was irrigated, and a drain was placed. This patient required 14 d to heal the perforation, with radiographic resolution on the second esophagram.

Twenty-five patients were analyzed (Table). Fourteen patients (56%) were male, and 11 patients (44%) were female. All patients were premature at the time of diagnosis, with an average post-conceptual age of 26.5 ± 2.3 wk. The average weight was 760 ± 288 g. The patients all had other comorbid conditions related to prematurity. Most were respiratory in nature and included neonatal respiratory distress syndrome, bronchopulmonary dysplasia, and apnea of prematurity. All patients received a surgical consultation at the time of presentation.

Twenty patients (80%) were diagnosed during the first week of life, with 23 (92%) patients presenting as transfers from outside hospitals secondary to the perforation occurring shortly after birth. The other five patients ranged in age from 1 to 4.7 wk old at diagnosis. All patients had an iatrogenic etiology to their injury. We restricted our sample to perforation secondary to OGT placement. The size of the OGT was

Table – Summary of patient demographics and treatment.

Demographics	
Number of cases, n	25
Gender	
Male, n (%)	14 (56)
Female, n (%)	11 (44)
Post-conceptual age, wk	$26.5 \pm 2.3^*$
Weight, g	$760 \pm 288^*$
Race, n (%)	
White	13 (52)
Black/African-American	9 (36)
Biracial/multiracial	2 (8)
Other	1 (4)
Treatment course	
Management	
Nonoperative, n (%)	25 (100)
Operative, n (%)	0 (0)
Days to f/u imaging	7 (IQR 7-10) [†]
Number of studies needed before resolution of perforation	
One study, n (%)	24 (96)
Two studies, n (%)	1 (4)
Days to enteral feeds	8 (IQR 7-11) [†]
Days antibiotic	7 (IQR 7-10) [†]
Other interventions	
TPN, n (%)	25 (100)
Pigtail or chest tube, n (%)	
Right, n (%)	7 (87.5)
Left, n (%)	1 (12.5)

* Average \pm stdev.

[†] Median, Interquartile range.

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