

Current concepts in the surgical approach to necrotizing enterocolitis

Mehul V. Raval, R. Lawrence Moss*

Division of Pediatric Surgery, Nationwide Children's Hospital, The Ohio State University College of Medicine, Columbus, OH, USA

Abstract

Necrotizing enterocolitis (NEC) is the most common surgical emergency occurring in neonatal intensive care unit (NICU) patients. Among patients with NEC, those that require surgery experience the poorest outcomes and highest mortality. Surgical intervention, while attempting to address the intestinal injury and ongoing multifactorial physiologic insults in NEC is associated with its own stresses that may compound the ongoing physiologic derangement. Surgery is thus reserved for those patients with clear indication for intervention such as pneumoperitoneum, confirmed stool or pus in the peritoneal cavity, or worsening clinical status. The purpose of this review is to briefly describe the physiologic stress induced by surgical intervention in the preterm, low birth weight patient with NEC and to provide a contemporary overview of available surgical management options for NEC. The optimal surgical plan employed is strongly influenced by clinical judgment and theoretical benefits in terms of minimizing physiologic stressors while providing temporary and/or definitive treatment in a timely fashion. While the choice of operation has not been shown to have a significant effect on any clinically important outcomes, ongoing investigations continue to study both short and long-term outcomes in patients with NEC.

© 2013 Elsevier Ireland Ltd. All rights reserved.

Keywords: Necrotizing enterocolitis; Surgery; Neonatal surgery; Neonatal intensive care unit; Prematurity

1. Introduction

Necrotizing enterocolitis (NEC) remains one of the most challenging diseases to diagnose and treat among neonatal intensive care unit (NICU) patients. NEC is the most common surgical emergency and the most common cause of gastrointestinal-related morbidity in the NICU [1,2]. Patients with NEC who undergo surgical interventions have the worst outcomes and highest costs [3]. Though the definitive pathophysiology of NEC has not been fully elucidated, NEC is predominantly a disease of low birth weight, premature infants, which is only occasionally seen in term infants [2]. The changes in intestinal microbiota, loss of the gut barrier, microcirculatory changes, and other pathophysiologic etiologies observed in NEC are more pronounced in the premature newborn with naïve physiology, limited reserve, heightened fluid and electrolyte balance sensitivity, increased energy

requirements, and altered immunologic and stress response. As overall NICU care has advanced and the survival of preterm infants has improved, a corresponding increase in prevalence of NEC has been observed. Surgical intervention, while attempting to address the intestinal injury and ongoing multifactorial physiologic insult, is associated with a variety of inherent stresses that may compound the physiologic derangement observed in NEC. While the pathophysiologic basis of NEC is extensively covered in other chapters in this compendium, the purpose of this review is to briefly describe the physiologic stress induced by surgical intervention. Specific topics that may be of significance in the low birth weight, premature infant undergoing surgery will be addressed. Subsequently, the various surgical options available in the management of NEC will be explored. The surgical option employed is strongly influenced by clinical judgment and theoretical benefits in terms of minimizing physiologic stressors while providing temporary and/or definitive treatment in a timely fashion. While the choice of operation has not been shown to have a significant effect on any clinically important outcomes, ongoing investigations continue to study both short and long-term outcomes in patients with NEC.

* Corresponding author at: Nationwide Children's Hospital, E. Thomas Boles Jr., Professor of Surgery, The Ohio State University, College of Medicine, 700 Children's Drive, Columbus, OH 43205, USA.
Tel.: +1 614 722 5163; fax: +1 614 722 5995.

E-mail address: larry.moss@nationwidechildrens.org (R.L. Moss).

2. Presentation and diagnosis

A variety of factors have been proposed to be associated with the development of NEC including prematurity, enteral feedings, steroid use, hypotension/ischemia, presence of a patent ductus arteriosus, and infection [2,4,5]. Among these, only prematurity has been consistently associated with NEC and need for surgical intervention [6,7]. Early recognition of NEC development is a clinical challenge. Early NEC can be difficult to distinguish from relatively benign conditions such as feeding intolerance commonly associated with prematurity to severe conditions such as neonatal sepsis. Subtle initial signs such as feeding intolerance and abdominal distention are often followed by temperature instability, lethargy, apnea, and bradycardia. Severe or “surgical” disease often includes the development of abdominal tenderness, peritonitis, abdominal wall discoloration, and identification of palpable abdominal mass. Though fixed abdominal mass and abdominal wall erythema are highly specific signs of intestinal necrosis, less than 10% of patients with surgical NEC will have these findings [8]. At the other end of the clinical spectrum, NEC can progress to multi system organ failure or death within a few hours of onset. Though most commonly occurring in the terminal ileum, NEC may involve any and/or non-contiguous portions of intestine. When the entire gut is ischemic, the clinical picture is referred to as “NEC totalis”.

Laboratory findings are often non-specific during the initial phases of NEC. Metabolic acidosis, neutropenia, left shift of segmented neutrophils, and hyponatremia are the most concerning laboratory aberrations. Thrombocytopenia, especially with a rapid drop in the platelet count, is a poor prognostic sign [1]. A combination of these laboratory values has been used in scoring systems to predict the timing and type of surgical intervention in NEC [9]. Attempts to identify biochemical markers specific to necrotizing enterocolitis have not been successful and remain an area of ongoing research.

A variety of imaging modalities are now available in the NICU population but abdominal plain films have remained the mainstay for NEC diagnosis for decades. Pneumoperitoneum identified on plain films mandates surgical intervention [10]. Pneumotosis intestinalis, the most specific finding for diagnosing NEC, as well as portal venous gas or fixed dilated air-filled loops can confirm the diagnosis but are not necessarily indications for surgical intervention (Fig. 1). Abdominal ultrasound is increasingly available in most NICU settings and can be used to assess intestinal peristalsis, bowel wall thickness, and to identify to fluid collections. Ultrasound technology has improved to include Doppler flow assessment as well as more detailed imaging ability with high frequency transducers. Ultrasound can be readily performed at the bedside, is noninvasive, and avoids ionizing radiation. Though several institutions with experienced technicians have shown high sensitivity and specificity of ultrasound to detect necrotic bowel in NEC [11,12], the generalizability of this imaging modality to consistently provide information beyond that

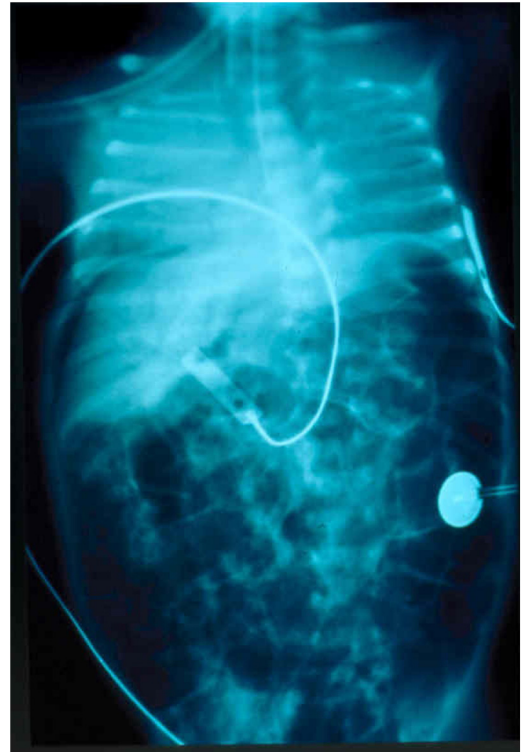


Fig. 1. Plain radiograph of extensive pneumotosis intestinalis and free air in a patient with necrotizing enterocolitis.

provided in plain films remains to be determined. Other imaging studies such as contrast studies, computed tomography scans, and magnetic resonance imaging are available but have not proven to be of significant utility in the acute management of NEC [13]. Ultimately, surgical intervention is reserved for those patients with pneumoperitoneum, confirmed stool or pus in the peritoneal cavity, or worsening clinical status.

3. The physiologic stress of surgery

Once the decision to proceed with surgery has been made it is imperative to anticipate the physiologic impact of the ensuing stress response of the surgical intervention itself. Operative intervention is often described as a controlled, induced trauma. Numerous changes occur in response to the surgical intervention from increased metabolic demands, to triggered inflammatory and immune cascades, and to alterations in the endocrine balance [14]. All of these changes are magnified in the preterm newborn [15]. After operative trauma, metabolism increases to provide substrates needed for regenerating and healing tissue. In newborns undergoing major abdominal surgery, catecholamine release, oxygen consumption, and resting energy expenditure peak at 4 h post-operatively and then return rapidly to baseline within the first 24 h of surgery [16,17]. Moderate intraoperative opiate dosing has been shown to blunt the immediate stress response and may be associated with an improved postoperative

Download English Version:

<https://daneshyari.com/en/article/4137006>

Download Persian Version:

<https://daneshyari.com/article/4137006>

[Daneshyari.com](https://daneshyari.com)