



ORIGINAL ARTICLE

Correlation between pneumoperitoneum and surgical findings and morbidity and mortality in newborns with necrotising enterocolitis[☆]

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KEYWORDS

Necrotising enterocolitis;
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Abstract

Introduction: Surgical intervention in necrotising enterocolitis (NEC) is correct when there is intestinal gangrene. This is evident when gangrene produces perforation and pneumoperitoneum, with this being the only universally accepted radiological indication for the surgical intervention of NEC.

Objective: To perform an analysis on patients with surgically managed NEC, including determining how the decision to intervene is reached, the outcomes, and if patients with perforation had a pneumoperitoneum.

Methods: Retrospective review of neonates with surgical NEC over a period of 10 years (2006–2015). An analysis was made of pre-surgical X-ray findings, which were compared with surgical ones, in addition to the morbidity and mortality, depending on the presence (N+) or absence (N–) of pneumoperitoneum. An evaluation was also made of the interobserver concordance with a paediatric radiologist blinded to the clinical reason using the *kappa* agreement index.

Results: A total of 53 neonates were included in the study. Surgical treatment was indicated after observing pneumoperitoneum in 36%. In the remaining neonates, the surgical decision was made after noting a clinical and metabolic deterioration with classical X-ray findings. Intestinal perforation was observed in 39% of the N– neonates.

There were no statistical differences between either group on analysing the excised intestinal length, days of intubation, starting of enteral nutrition, and the mortality rate. Comparisons

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PALABRAS CLAVE

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in terms of duration of symptoms and total hospital stay were statistically significant (7 vs. 2 days, $p=0.008$; 127 vs. 79 days, $p=0.003$, respectively), with both being more favourable in the N+ group. These differences remained when the groups were adjusted by birthweight.

Conclusions: Surgical indication has to be done on an ensemble of clinical and radiological evidence, as 39% of the neonates in the N- groups were perforated.

In our study, the presence of a pneumoperitoneum did not correlate with a worse prognosis. © 2018 Published by Elsevier España, S.L.U. on behalf of Asociación Española de Pediatría. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Correlación entre el neumoperitoneo y los hallazgos quirúrgicos y morbimortalidad en recién nacidos con enterocolitis necrosante

Resumen

Introducción: La intervención quirúrgica en las enterocolitis necrosantes (EN) es precisa cuando existe gangrena intestinal, hecho evidente cuando produce perforación y neumoperitoneo, siendo este la única indicación radiológica aceptada universalmente para la intervención quirúrgica.

Objetivo: Analizar a los pacientes intervenidos de EN, saber por qué se les intervino, cómo evolucionan y si los pacientes perforados presentan neumoperitoneo.

Método: Estudio retrospectivo de una cohorte de recién nacidos con EN intervenidos durante un periodo de 10 años (2006-2015). Se analizan los hallazgos radiológicos preoperatorios y se correlacionan con los quirúrgicos y con la morbimortalidad, dependiendo de la presencia de neumoperitoneo (N+) o no (N-). Se evaluó la concordancia interobservador con radiólogo pediátrico enmascarado a la clínica mediante el índice de acuerdo *kappa*.

Resultados: Se analizó a 53 pacientes. El 36% se intervino tras la visualización de neumoperitoneo; en el resto, la indicación fue deterioro clínico y metabólico, junto con hallazgos radiológicos asociados. En el 39% del grupo N- se objetivó perforación.

No se encontraron diferencias significativas en ambos grupos con respecto a longitud intestinal reseca, días de intubación, día de inicio de nutrición enteral y mortalidad. La comparación entre duración de síntomas y estancia hospitalaria total en ambos grupos (N-/N+) fue significativa (7 vs. 2 días, $p=0,008$; 127 vs. 79 días, $p=0,003$ respectivamente), siendo más favorable en el grupo N+. Estas diferencias se mantuvieron al ajustar por peso.

Conclusiones: La indicación quirúrgica ha de basarse en un conjunto de datos clínicos y radiológicos, ya que el 39% de los pacientes sin neumoperitoneo presentaron perforación.

En nuestro estudio la presencia de neumoperitoneo no se correlaciona con peor pronóstico. © 2018 Publicado por Elsevier España, S.L.U. en nombre de Asociación Española de Pediatría. Este es un artículo Open Access bajo la licencia CC BY-NC-ND (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Necrotising enterocolitis (NEC), first described by Siebold in 1825,¹ is the most common gastrointestinal emergency occurring in neonatal intensive care units (NICUs),² with an estimated incidence of 0.3–3 cases per 1,000 live births.^{3,4} Its aetiology is not well understood, although it is hypothesised that it is related to decreased perfusion and ischaemia of the intestinal wall (particularly in immature intestines), leading to disruption of the intestinal barrier and enabling bacterial passage and activation of inflammatory mediators.⁵ The main risk factors for the development of this disease are preterm birth, perinatal asphyxia, early enteral feeding in preterm newborns, congenital heart defects and umbilical catheterization, among others.⁵

Necrotising enterocolitis should not be confused with focal intestinal perforation, which is less frequent and affects up to 2% of extremely low birth weight infants.³ Other differential features of focal intestinal perforation are: lack of systemic involvement, absence of intestinal pneumatosis, earlier onset, lower birth weight and extreme prematurity.³

Necrotising enterocolitis is classified according to the staging criteria proposed by Bell et al. as stage I (suspected), II (proven) or III (advanced),⁶ a system that was later modified by Walsh and Kliegman in 1986.⁷ In this modified scheme, stages are further subdivided into A or B depending on the radiographic findings: stage IA or B (normal or intestinal dilation), stage IIA (ileus, pneumatosis intestinalis) or IIB (portal venous gas), stage IIIA (ascites) or IIIB (pneumoperitoneum).^{5,6} Another classification scheme was published in the *Vermont Oxford Network Manual of*

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