ROSHANE MOHIDIN
PAEDIATRICS

Elective Report

Objectives

Describe the pattern of disease/illness of Necrotising Enterocolitis in the population

Determine the pattern of health provision in relation to the UK and contrast it with other countries.

Health related objective to participate in an audit focusing on the amount of fluid required to resuscitate an infant with necrotising enterocolitis and hence elucidate current practice on this topic in London Neonatal Units.

Personal objective is to contribute towards the above audit and hence reflect upon aspects of good clinical care and the importance of auditing/reviewing protocol within the NHS.

Write-Up

Necrotising enterocolitis (NEC) is the most common condition affecting the gastrointestinal system in premature neonates with life threatening implications (1). It is a condition which involves the death of intestinal tissue lining resulting in NEC being a leading cause of mobidity and mortality. It affects 0.3 to 2.4 per 1000 live births and 2-5% of all premature infants (1). The overall mortality in infants with necrotising enterocolitis varies from 20 to 50% (1).

There are certain risk factors which are associated with necrotising enterocolitis such as prematurity, infants on concentrated formula feeds and infants with congenital heart disease (1). However the exact pathophysiology of NEC is still unknown but it is thought to differ with respect to premature neonates and term infants (2). Premature neonates are thought to suffer from necrotising enterocolitis due to the gastrointestinal tract being immature. In contrast with respect to term infants, the condition may present a few days following a history of ischaemia or hypoxia as seen in infants with congenital heart disease (2). There are also theories relating to the role of commensal organisms or probiotics which affect the intestinal integrity and bacterial colonisation, consequently there is now promising methods of preventing NEC via probiotic supplements according to a study by Martin et al (2008) (3).

Infants commonly present with the following clinical features:

- Distension of Abdomen
- Blood in the Stool
- Difficulty with Feeding
- Diarrhoea and Vomiting

In terms of reaching the diagnosis of NEC, clinicians will refer to such values as the leukocyte count and CRP as warning signs (4). They will also review the infant's platelet count to identify thrombocytopenia a sign of severe NEC (4). An elevated lactate level is suggestive of poor outcome and is hence also a useful prognostic marker (5). Infants would also require imaging in the form of an abdominal radiograph to identify features like dilated bowel loops and in severe cases pneumoperitoneum as seen in perforation of bowel.

The treatment of the NEC depends on the severity of the condition. In cases where the bowel has perforated, emergency surgery is required to resect the necrosed bowel. However in less severe cases the patient can be managed via supportive medical therapy involving stopping enteral feeds and utilising fluids instead and beginning antibiotic therapy. I was involved in an audit which sought to elucidate current practice with respect to the type and amount of fluids used in resuscitation of NEC infants. Current studies dictate that isotonic saline is the fluid of choice but there is limited literature relating to the benefit of crystalloid versus colloid fluid therapy (6). This audit hypothesised that a greater amount of fluid was required to resuscitate an infant the higher the stage of NEC (see Figure 1) (7) (8). I was able to contribute to this audit by designing the spreadsheet and fields for the data collection and subsequently I was involved in inputting the data. This process taught me a valuable lesson in the importance of good clinical care. As healthcare professionals it is essential to constantly re-evaluate protocol and hence ensure the optimum standard of care is provided.

Bell's stage	Clinical findings	Radiographic findings	Gastro-intestinal findings
I	Apnoea and bradycardia, temp instability	Normal gas pattern or mild ileus	Gastric residuals, occult blood in stool, mild abdominal distension
II A	Apnoea and bradycardia, temp instability	Ileus gas pattern with one or more dilated loops and focal pneumatosis	Grossly bloody stools, prominent bowel distension, absent bowel sounds
II B	Thrombocytopaenia and mild metabolic acidosis	Widespreac pneumatosis, ascites, portal venous gas	Abdominal wall oedema with palpable loops and tenderness
III A	Mixed acidosis, oliguria, hypotension, coagulopathy	Prominent bowel loops, worsening ascites, no free air	Worsening wall oedema, erythema and induration
III B	Shock, deterioration in laboratory values and vital signs	Pneumoperitoneum	Perforated bowel

Figure 1: Modified Bell's Staging Criteria (7)

Within the UK health provisions are in place to manage infants with severe NEC as there are more than adequate equipment and medication available to clinicians as well as such resources as neonatal transport teams which can transfer infants to surgical centres if indicated. However in developing countries there is a lack of resources in particular access to surgical intervention. Despite this, some evidence suggests that a lack of surgical interventions will not affect the mortality outcome (9) (10).

However factors which will certainly affect the outcome of the infant include the countries access to medicine in this case antibiotics as well as fluid therapy and a multi disciplinary team to carry out the relevant investigations and effective management of the patient.

References

1) Hunter CJ, Upperman JS, Ford HR, Camerini V. Understanding the susceptibility of the premature infant to necrotizing enterocolitis (NEC). Pediatr Res. 2008 Feb;63(2):117-23.

2) Bolisetty S, Lui K, Oei J, Wojtulewicz J 2000 A regional study of underlying congenital diseases in term neonates with necrotizing enterocolitis. Acta Paediatr 89:1226–1230

3) Martin CR, Walker WA. Probiotics: role in pathophysiology and prevention in necrotizing enterocolitis. Semin Perinatol. 2008 Apr;32(2):127-37.

4) Hutter J, Hathaway W, Wayne E. Hematologic abnormalities in severe neonatal necrotizing enterocolitis. J Pediatr 1976; 88: 1026–1031.

5) Kessler U, Mungnirandr A, Nelle M, Nimmo AF, Zachariou Z, Berger S. A simple presurgical necrotising enterocolitis-mortality scoring system. J of Perinatology (2006) 26, 764-768

6) Boluyt N, Bollen CW, Bos AP, Kok JH, Offringa M. Fluid resuscitation in neonatal and pediatric hypovolemic shock: a Dutch Pediatric Society evidence-based clinical practice guideline. Intensive Care Med. 2006 Jul;32(7):995-1003. Epub 2006 May 24.

7) Banerjee J, Mohinuddin S, Fluid management from diagnosis to stabilisation phase in Necrotising enterocolitis (2012) (In progress)

8) Modified Bell's Staging Criteria for NEC taken from http://www.medicalcriteria.com/criteria/ped_nec.htm

9) Kanto WP, Jr, Wilson R, Ricketts RR. Management and outcome of necrotizing enterocolitis. Clin Pediatr (Phila) 1985;24:79–82.

10) Abdullah F, Zhang Y, Camp M, et al. Necrotizing enterocolitis in 20,822 infants: analysis of medical and surgical treatments. Clin Pediatr (Phila) 2010;49:166–71.