4. Steffen RM, Wyllie R, Petras RE, et al (1991) The spectrum of eosinophilic gastroenteritis: report of 6 pediatric cases and review of the literature. Clin Pediatr 30 (7):404–411
5. Talley NT, Shorter RG, Phillips SF, et al (1990) Eosinophilic gastroenteritis: a clinicophatological study of patients with disease of the mucosa, muscle layer, and subserosal tissues. Gut 31:54–58

A. Aquino · M. Dòmini (✉)[1] · C. Rossi · A. Fakhro
P. Lelli Chiesa
Cattedra di Chirurgia Pediatrica,
Universita' "G.D'Annunzio", Pescara, Italy

C. D'Incecco
Divisione di Neonatologia,
Ospedale "Spirito Santo",
Pescara,
Italy

Present address:
[1]Via S. Domenico 11,
40124 Bologna, Italy,
e-mail: m.domini@chirped.unich.it,
Tel.: +39-85-4252820,
Fax: +39-85-4252615

A. J. Petros · R. Heys · R. C. Tasker
P-M. Fortune · I. Roberts · E. Kiely

Near infrared spectroscopy can detect changes in splanchnic oxygen delivery in neonates during apnoeic episodes

Received: 25 May 1998
Accepted: 2 July 1998

Sir: The pathogenesis of necrotising enterocolitis (NEC) is still unknown. Proposed risk factors include prematurity, the presence of bacteria within the lumen of the gut [3], and enteral feeding [2]. We hypothesised that alteration in the splanchnic oxygen delivery may be the final common pathway which links these diverse risk factors.

Near infrared spectroscopy (NIRS) can determine changes in concentration of oxyhaemoglobin (HbO_2), deoxyhaemoglobin (Hb) and regional blood volume (Hbvol) and has an established role in continuous, non-invasive, in-vivo monitoring of cerebral oxygenation [1].

This study was approved by the local research ethics committee. Simultaneous measurements were made of peripheral oxygen saturation (SpO_2), heart rate, abdominal HbO_2, Hb and Hbvol. Infrared light was emitted and received from small optodes (Niro 500, Hamamatsu Photonics, Japan) placed 23 mm apart upon the abdomen just above the umbilicus and protected from light. We report three neonates with apnoea. Case 1, an infant of 28 weeks gestation weighing 0.975 kg required ileal resection for intestinal perforation. Four days after tracheal extubation, at 2 weeks of age, she developed frequent episodes of apnoea and bradycardia having up to 20 self-limiting desaturations per day. The lowest SpO_2 was 65%. She subsequently developed extensive NEC and died. Case 2, an infant of 33 weeks gestation, weighing 3.3 kg, was referred at 8 weeks of age because of up to 10 apnoeic episodes per day. Investigation revealed gastro-oesophageal reflux and aspiration, necessitating surgical treatment. Case 3, an infant of 37 weeks gestation, weighing 1.8 kg, was monitored during weaning from mechanical ventilation. Two attempts to wean supplemental oxygen to room air failed. After settling he was given his routine feed while still being monitored.

In all three cases, a fall in SpO_2 coincided with a fall in gastro-intestinal HbO_2 signal and rise in gastro-intestinal Hb. Although episodes of systemic desaturation recovered within 2 min, recovery of HbO_2 and Hb was delayed and took an extra 3 min. Such rapid changes in gastro-intestinal oxygen delivery observed with NIRS have not been previously reported. Case 3 also demonstrates that after an enteral feed both the gastro-intestinal blood volume and oxygen delivery increased. Repeated episodes of apnoea and hypoxia causing systemic desaturation may result in chronic ischaemia of the gut due to delayed re-oxygenation even though there is rapid recovery in SpO_2. Thus, although hypoxia is considered to be a minor risk factor in NEC, significant splanchnic hypoxia apparently occurs during periods of desaturation and lasts longer than has until now been appreciated.

References

1. Edwards AD, Wyatt JS, Richardson C, Delpy DT, Cope M, Reynolds EO (1988) Cotside measurement of cerebral blood flow in ill newborn infants by near infrared spectroscopy. Lancet 2:770–771
2. Kanto EP, Hunter JE, Stoll BJ (1994) Recognition and medical management of necrotizing enterocolitis. Clin Perinatol 21:335–336
3. Szylit O, Butel MJ, Rimbault A (1997) An experimental model of necrotising enterocolitis. Lancet 350:33–34

A. J. Petros (✉) · R. Heys · R. C. Tasker
P-M. Fortune · I. Roberts · E. Kiely
Paediatric Intensive Care Unit and Department
of Paediatric Surgery,
Great Ormond Street Hospital for Children NHS Trust,
London WC1N 3JH, UK,
Fax: +44-171-813-8206

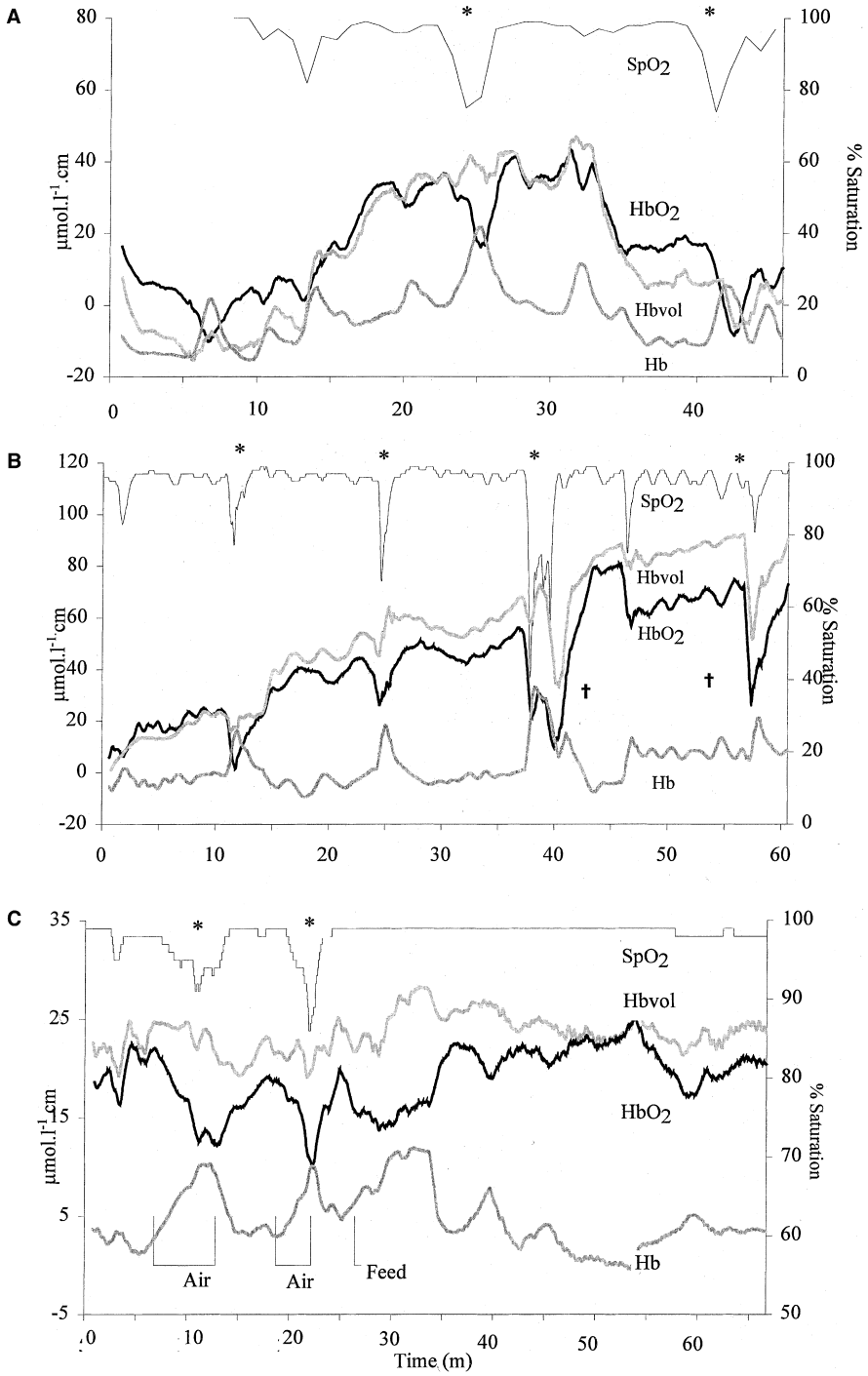

Fig. 1A–C Changes in peripheral haemoglobin saturation (SpO_2) and abdominal oxyhaemoglobin (HbO_2), deoxyhaemoglobin (Hb) and blood volume (Hbvol). **A** Case 1 shows two significant peripheral desaturations (*) and a coincident overall increase in HbO_2. **B** Case 2 shows four significant episodes of peripheral desaturation and a decrease in Hbvol during the more severe bouts (†). **C** Case 3 shows two episodes of peripheral desaturations followed by an enteral feed and a decrease in Hb and an increase in HbO_2 and Hbvol