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Sepsis as a complication of parenteral nutrition in children

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Parenteral nutrition (PN) provides a lifeline to infants unable to absorb adequate nutrition via the usually preferred enteral route. However, parenteral nutrition brings about potential complications such as electrolyte imbalances, gastrointestinal atrophy and septicaemia[(1)]. Therefore, infection of central lines remains a major clinical concern, especially in paediatrics patients, who have relatively more vulnerable immune systems and therefore a concomitant higher morbidity and mortality.

In view of this, an audit of sepsis incidence in all children receiving PN at the Children's Hospital for Wales, Cardiff, was performed to compare sepsis incidence with available figures from the literature to benchmark performance, as well as to introduce changes if deemed necessary.

The case notes of all PN cases (except neonates) in 2006–2007 were obtained from pharmacy records and reviewed for indications and PN duration. Electronic results reporting systems were used to review biochemical and microbiological results. Sepsis during PN was defined as 'likely' if the CRP level exceeded 50 mg/l, and was proven by positive blood cultures[(2)]. Chi-square analysis was used to verify statistical significance.

82 notes from 103 cases were reviewed, of which 38 patients were from 2007 and 44 patients from 2006. Only cases with complete records were used to allow for a fair comparison; the remaining 21 had either missing or incomplete CRP/blood culture records. The indications for PN were chemotherapy (27), post-surgery (26), non-functioning bowel (17) and others (12). Overall, 20/82 patients had a positive blood culture. The main microorganisms found in the positive blood cultures were coagulase-negative Staphylococci (20 cases), Enterococci (4), *Escherichia coli* (3), coagulase-positive Staphylococci (2) and *Candida albicans* (2).

	Duration of parenteral nutrition			
	≤4 days	5–9 days	10–24 days	≥ 25 days
Raised CRP >50 mg/l	10/15(67%)	14/25(56%)	15/22(68%)	18/20(90%)
Positive blood culture	0/15(0%)	1/25(4%)	8/22(36%)	11/20(55%)

Chi-square analysis of positive blood cultures against duration was highly significant ($P = 0.00005$), thus suggesting that the effect of PN duration on positive blood cultures was significant.

Also, elevated CRP was present in high percentages in all period lengths, and as CRP is also elevated in the 0–4 and 5–9 day periods despite low numbers of positive blood cultures (which are the definitive indicator of sepsis), this seems to imply that CRP may not be a reliable indicator of sepsis in the early phases, presumably due to postoperative inflammatory changes. This is borne out by a high *P*-value of 0.10, which is insufficient to rule out chance affecting the significance of high CRP values ($\chi^2 = 6.19$ with 3 degrees of freedom).

In conclusion, sepsis during PN remains a relatively common challenge for paediatric patients, particularly those with underlying gastroenterological dysfunction. Also, CRP may not be a reliable indicator for sepsis in the early phases, presumably due to postoperative inflammatory changes. Suggestions from the result of these findings for future practice include adding a checkbox to daily casenotes to require medical staff to explain the need to continue PN for another day rather than continue by default. Also, prophylactic antibiotics may be indicated in PN cases exceeding 10 days. It is also noted that there is currently a lack of NICE guidelines for parenteral use in children.

Furthermore, use of tunnelled subclavian lines should be encouraged in children beyond the NICE guidelines for adults, which currently only recommend them for intended use beyond 30 days[(3)].

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