PublisherInfo		
PublisherName	:	BioMed Central
PublisherLocation	:	London
PublisherImprintName	:	BioMed Central

Nitric oxide reduces hypertensive crises following surgery for congenital heart disease

ArticleInfo		
ArticleID	:	4250
ArticleDOI	:	10.1186/ccf-2000-2781
ArticleCitationID	:	2781
ArticleSequenceNumber	:	38
ArticleCategory	:	Paper Report
ArticleFirstPage	:	1
ArticleLastPage	:	4
ArticleHistory	:	RegistrationDate : 2000–12–21 OnlineDate : 2000–12–21
ArticleCopyright	:	Current Science Ltd2000
ArticleGrants	:	
ArticleContext	:	1305433

Dave De Beer

Keywords

Congenital heart surgery, nitric oxide, pulmonary hypertension, pulmonary hypertensive crises

Comments

Although nitric oxide is commonly used in the treatment of pulmonary hypertensive crises (PHTCs) following corrective surgery for congenital heart disease (CHD), its role in preventing these complications is uncertain. This well designed study shows the benefits of using low-dose nitric oxide prophylactically in infants at high risk of pulmonary hypertension. However, although there was a reduction in the frequency of PHTCs following surgery, it is important to note that they were not prevented altogether. Furthermore, there was no significant difference in mortality between the two groups. The authors acknowledge that, in order to investigate mortality differences reliably, a greater number of patients would need to be recruited.

Introduction

Pulmonary hypertension and in particular PHTCs are a major cause of morbidity and mortality following surgery for CHD. Reduced bioavailability of the endothelium-derived vasodilator nitric oxide in children with congenital left-to-right shunt lesions, may predispose them to pulmonary vasoconstriction and PHTCs postoperatively. Inhaled nitric oxide is a selective pulmonary vasodilator with established efficacy and safety in treating children. This study aimed to determine the role of routinely administered nitric oxide in preventing pulmonary hypertension after high-risk surgery for CHD.

Methods

- Prospective, randomised, double-blind trial
- A total of 130 consecutive patients undergoing corrective surgery for congenital heart disease were recruited (76% with large ventricular or atrioventricular septal defects)

- Patients were randomised to receive either continuous nitric oxide 10 ppm (n = 63) or placebo (n = 61) after surgery until just prior to extubation
- Maximum duration for administration of nitric oxide was set at 7 days
- Pulmonary artery, systemic artery, right and left atrial pressures and pulse oximetry were monitored continuously while cardiac index, pulmonary and systemic vascular resistances were calculated by thermodilution
- The number of PHTCs (defined as episodes with a pulmonary/systemic artery pressure ratio > 0.75) and the time spent on nitric oxide and in intensive care were also recorded
- Analysis of the results was done by intention to treat

Results

In total, 124 patients were randomised, the remaining six being excluded owing to lack of parental consent. Compared with placebo, infants who received inhaled nitric oxide:

- had significantly fewer PHTCs (median four [IQR 0-12] versus seven [1-19]; relative risk, unadjusted 0.66, $P < 0.001$, adjusted for dispersion 0.65, $P = 0.045$);
- were ready for extubation earlier (median time to eligibility for extubation 80 h [38-121] versus 112 h [63-164]; $P = 0.019$);
- received nitric oxide for a shorter time period in total, despite having a longer weaning time (87 h [43-125] versus 117 h [67-168], $P = 0.023$)
- were significantly less likely to be ventilated at 7 days (6 [10%] versus 16 [26%], $P = 0.02$).

The median time to discharge from the intensive care was shorter in the nitric oxide compared to the placebo group (138 h [89-192] versus 162 h [96-222]), although this was not significant. There were eight deaths (6.5% of total study group, five on nitric oxide and three on placebo; $P = 0.49$), none of which seemed related to the administration of nitric oxide. There were no clinically important toxic effects during the trial. On the basis of these results, the authors suggest that the routine use of inhaled nitric oxide at 10 ppm in infants at high risk of pulmonary hypertension, can reduce the frequency of major PHTCs and shorten the postoperative course following corrective surgery for CHD. The fact that its use did not abolish these crises altogether may have been due to an insufficient dose of nitric oxide being used, (although the authors have previously shown that doses as low as 2 ppm are effective in reversing PHTCs [see Additional information]). The lack of a significant mortality difference between the two groups may be explained, in part, by the rapid detection and treatment of PHTCs, initially with non-nitric oxide measures and then with rescue nitric oxide if required.

Additional information

Miller OI, Celermajer DS, Deanfield JE, Macrae DJ: **Very low dose inhaled nitric oxide: a selective pulmonary vasodilator after surgery for congenital heart disease.** *J Thorac Cardiovasc Surg* 1995, **108**:487-494.

References

1. Miller OI, Tang SF, Keech A, Pigott NB, Beller E, Celermajer DS: Inhaled nitric oxide and prevention of pulmonary hypertension after congenital heart surgery: a randomised double-blind study. Lancet . 2000, 356: 1464-1469.