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## Enteral feeding in Prostaglandin-dependent neonates: is it a safe practice?

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### Abstract

In many centers presurgical term neonates with prostaglandin (PGE<sub>1</sub>)-dependent cardiac lesions experience nutritional deficiency due to postponed enteral feeds. We recently adopted early enteral feeding in these infants. This retrospective study reveals feeding tolerance in 33 of 34 neonates fed enterally while receiving PGE<sub>1</sub>, suggesting the safety of this practice.

### Keywords

Nutrition; prostaglandin; pediatrics; cardiovascular disease; necrotizing enterocolitis

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Though the physiological and nutritional benefits of early enteral feeding (particularly human milk) in neonates are a well-studied subject in the premature and term infant populations, it has yet to be investigated in presurgical term neonates with ductal-dependent congenital heart disease. There is little agreement among centers that care for infants with congenital heart disease regarding the safety or risks of early enteral feeding in infants with ductal dependent cardiac lesions requiring continuous prostaglandin (PGE<sub>1</sub>) therapy. After careful review of the literature, we were unable to find any studies in support of, or refuting early enteral feeding in this population of infants. Therefore it is not surprising to find it common practice to refrain from enteral feeding until these patients have been surgically corrected due to the concern that they may develop necrotizing enterocolitis (NEC). At the present time, the risks of PGE<sub>1</sub>-related feeding intolerance have not been well defined.

In contrast to the current varied practice in the United States, many European pediatric intensive care units enterally feed these ductal-dependent infants while awaiting surgery. In the previous unpublished experience of one of the authors, there have been no significant or documented

complications from this strategy. However, outcomes from this practice have not been published in the literature.

At our Children's Hospital we recognize the importance of optimized presurgical nutrient intake which is reflected in the recently instituted practice of early enteral feeding in infants receiving intravenous PGE<sub>1</sub> therapy. This retrospective study was designed to assess enteral feeding tolerance in PGE<sub>1</sub>-dependent neonates awaiting surgical repair since the inception of this practice at our institution.

## Methods

After receiving Institutional Review Board approval, we reviewed records of all infants greater than 35 weeks gestation and less than 28 days of age who were admitted with PGE<sub>1</sub>-dependent cardiac defects between March 2007 and December 2007. We elected to enroll only near-term and term infants so that gastrointestinal maturity would be relatively consistent among patients. Infants less than 35 weeks gestation were not enrolled since even modestly preterm infants commonly demonstrate feeding intolerance in the first weeks of life (1-3).

Reviewing those infants who were enterally fed, clinical and radiographic patient information was gathered. Feeding type, delivery, and caloric density were determined. Feeding intolerance was defined as: 1) clinically, per chart documentation of recurrent large volume (greater than 2/3 of prior feed) or bilious emesis, an increase in abdominal girth of 3 cm over an 8-hour period, or hemocult positive stools leading to feeding cessation and 2) radiographically, as bowel dysmotility, pneumatosis, abnormal bowel distention, pneumoperitoneum, portal venous air or gasless abdomen. Additional patient information gathered included the presence of umbilical catheters and the use of antibiotics, steroids, and vasopressors (Table 1).

## Results

From a total of 412 admissions to the Cardiac ICU from March 2007 to December 2007, 67 children met the inclusion criteria. Fifty-six of these neonates required PGE<sub>1</sub> therapy and of those, 34 patients were enterally fed. Twenty-two eligible infants were not enterally fed while on PGE<sub>1</sub> therapy for the following reasons: 14 infants underwent surgery in the first 48 hours of life and therefore were not fed, two infants were considered clinically unstable to be fed due to low cardiac output, three infants with Transposition of the Great Arteries (TGA) were on PGE<sub>1</sub> for transport and were not fed during that time and in 3 cases, feeding was withheld, according to the preference of attending physician.

We recruited a total of 34 PGE<sub>1</sub>-dependent term neonates, 21 male and 11 female. Background cardiac malformations were varied. Nineteen patients (56 %) had a right-to-left shunt through the ductus arteriosus, 11 (32 %) had a left-to-right shunt and 4 (12 %) had a bidirectional shunt (Table 2). All but one patient exhibited normal enteral feeding tolerance while receiving PGE<sub>1</sub> therapy. The only patient who exhibited feeding intolerance had the diagnosis of TGA with bidirectional shunt through the ductus arteriosus. While receiving PGE<sub>1</sub> at 0.0125 mcg/kg/min via an umbilical venous catheter and feeding ad lib, this infant demonstrated clinical and radiographic signs of feeding intolerance necessitating cessation of enteral feeds until surgery. This infant progressed favorably and was later discharged home following surgical repair.

## Discussion

The benefits of early enteral feeding in critically-ill term and pre-term infants have been widely recognized. Despite this acumen of information, neonates with PGE<sub>1</sub>-dependent congenital cardiac defects are often kept on parenteral nutrition and intestinal rest. Likely this practice is

due to lack of objective evidence leading most medical caregivers to the conservative practice of feeding restraint in this unique population (4), independent of the arterial ductal flow direction. Nevertheless, the effects of such a nutritional strategy in neonates and infants with congenital heart disease who require continuous PGE<sub>1</sub>-therapy are not known. Infants are consequently maintained on parenteral nutrition due to the presumed complications associated with feeding in this fragile population, namely necrotizing enterocolitis (NEC). Previous studies have endeavored to define the relationship between NEC and congenital heart disease. A retrospective review of 643 neonates with heart disease identified factors associated with an elevated risk of NEC (5). The factors that were recognized were: premature birth, hypoplastic left heart syndrome, truncus arteriosus and episodes of poor systemic perfusion or shock. Of note, it was observed that neonates with cardiac disease who develop NEC supposedly experience intestinal ischemia either by their pathophysiology or by an episode of decreased systemic perfusion.

Balance between the hypothetical complications of feeding neonates on PGE<sub>1</sub> infusions and the clear advantages of enteral feeding motivated the medical caregivers in our Institution to initiate presurgical enteral feeding in PGE<sub>1</sub>-dependent term neonates, beginning in March 2007. We were encouraged by the results of this practice, with 33 of 34 (97%) neonates with PGE<sub>1</sub>-dependent cardiac lesions exhibiting normal enteral feeding tolerance while awaiting surgical repair. Enteral feeding was well-tolerated independent of cardiac malformation or ductal-flow pattern and did not appear to be affected by the use of umbilical venous or arterial catheters. As this is a small retrospective review, conclusions regarding the safety of enteral feeding in PGE<sub>1</sub>-dependent neonates are speculative at this time. However, we believe this study points towards safely providing improved nutrition in this population through early initiation of enteral feeding. Further investigation of this practice is currently underway in our institution to more fully define the risks and benefits of enteral feeding in this unique population.

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