PDA Ligation in the Extremely Preterm Infant does not Decrease the Rate of Bronchopulmonary Dysplasia

Elizabeth M. Martin, John C. Hitchner, and Leif D. Nelin

Small Baby Pod, Nationwide Children's Hospital
Center for Perinatal Research, Research Institute at Nationwide Children's Hospital
Columbus, Ohio, United States

background

Extremely preterm infants are at high risk for developing a patent ductus arterious (PDA). It has been postulated that ligation of a PDA will improve lung function and decrease the risk of bronchopulmonary dysplasia (BPD). PDA ligation in preterm infants was the standard of care. However, more recent reports have suggested that PDA ligation may actually increase the incidence of BPD (Clyman, 2009; Madan, 2009). Furthermore, although studies on efficacy of NSAIDs in closing the PDA have been done, the effect of medically or surgically closing the PDA in the extremely preterm infant on outcomes have not been studied.

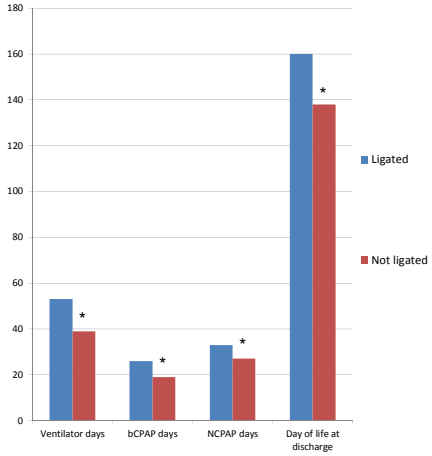
We have developed a Small Baby Pod (SBP) in our all-referral NICU for infants born at <27 completed weeks gestational age. The SBP is a specialized unit for extremely premature infants that involves care by a designated staff following consistent multidisciplinary guidelines (Nankervis, 2010; Moorehead, 2012; Gonya, 2013). Although, given the lack of evidence regarding PDA treatment in this population the protocol does not have specific recommendations concerning the PDA.

objectives

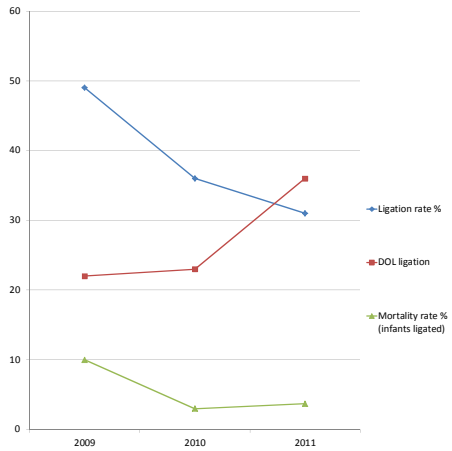
To test the hypothesis that the ligation of the PDA in extremely preterm infants will not improve the incidence of BPD.

methods

- **The Small Baby Database was used to collect data on all patients born at <27 completed weeks gestational age**
- **Eligible patients included those small babies who had the diagnosis of PDA and were admitted to the SBP from 1-03-2009 to 12-29-2011**
- **PDA was diagnosed using echocardiography**
- **Data was also collected on disease severity and other outcomes**
- **Continuous data were compared between groups using a t-test, while categorical data were compared using a Fisher's Exact Test. A p<0.05 was considered significant**



* Not ligated different from ligated, p<0.05



results

In the time-frame of this study there were 280 infants diagnosed with a PDA, of which 170 were not surgically ligated and 110 were surgically ligated.

There was no difference between the groups in terms of:
- **5 minute Apgar score**
- **day of life admitted to the Small Baby Pod**
- **supplemental oxygen use at 28 days (BPD)**
- **supplemental oxygen at 36 weeks (moderate and severe BPD)**

	Not Ligated (N=170)	Ligated (N=110)	p-value
Birth weight (grams)	751 ± 168	689 ± 149	<0.005
GA at birth (weeks)	24.9 ± 1.1	24.4 ± 1.1	NS
Indocin (prophylactic)	80%	92%	<0.05
Indocin (treatment)	43%	88%	<0.001
Mortality (both groups)	28%	6%	<0.001
Mechanical Ventilation (days)	33 ± 35	57 ± 81	<0.005
Discharge Day of Life	138 ± 53	160 ± 58	<0.01
Severe IVH (Gr III-IV)	23%	13%	0.04
NEC	25%	12%	0.01

discussion

Mortality and co-morbidities

- More patients undergoing a PDA ligation had prophylactic and treatment courses of indomethacin/ibuprofen.
- The rate of PDA ligation fell from 49% in 2009 to 31% in 2011 (p <0.02).
- Of the infants ligated, the mortality rate fell from 49% in 2009 to 4% in 2011 (p<0.001).
- The day of life on which the PDA was ligated increased from 22 ± 18 in 2009 to 36 ± 21 in 2011 (p<0.01).
- The overall mortality rate is 6% for the ligated group and 28% for the group that was not ligated.
- The rate of any NEC and severe IVH was greater in the group that was not ligated than in the ligated patients.
- Note that of those patients that did not get ligated but died, 65% (31/48) died prior to day of life 24.

conclusions

In extremely preterm infants in an all-referral NICU:

- **Patients who underwent PDA ligation were of lower birth weight than patients who did not get a PDA ligation.**
- **Patients in the no ligation group had more co-morbidities than did the ligation group, and these co-morbidities likely played a part in selection for surgery.**
- **Over the last several years the rate of PDA ligation has decreased, while the age at time of ligation has increased.**
- **Ligation of the PDA did not decrease time on mechanical ventilation or CPAP.**
- **Ligation of the PDA did not affect rates of BPD.**

- **We speculate that PDA ligation may not improve outcomes in this population. A large randomized controlled trial of PDA ligation is needed in this patient population to determine indications and benefits.**

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