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Patent ductus arteriosus ligation in premature infants in the United States

*Jun Tashiro, MD MPH, Bo Wang, MD, Juan E. Sola, MD, Anthony R. Hogan, MD, Holly L. Neville, MD, and Eduardo A. Perez, MD**

Division of Pediatric Surgery, Department of Surgery, University of Miami Miller School of Medicine, Miami, Florida

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ABSTRACT

Background: Patent ductus arteriosus (PDA) is a condition that commonly affects premature and low birth weight (BW) infants at times necessitating surgical intervention. We examined outcomes after surgical ligation (SL).

Materials and methods: We analyzed the Kids' Inpatient Database for premature infants diagnosed with PDA, admitted at <8 d of age. Patient demographics, disposition, morbidity, and mortality were analyzed. All cases were weighted appropriately to project nationally representative estimates.

Results: A total of 63,208 patients were identified with diagnosis of PDA. Of these, 6766 (10.7%) underwent SL. Lower gestational age (GA) and BW patients had higher incidence of PDA and rates of SL. Overall survival was 90.8% for the cohort. Survival for the SL group was 88.0% and 91.2% for the non-SL group; however, infants undergoing SL had higher survival rates up to 28 wk and 1250 g for GA and BW, respectively. GA did not affect post-SL survival adversely. Rather, lower BW was associated with extremely high mortality rates. Black infants and boys had lower survival compared with other races and girls, respectively. Larger hospitals had higher survival rates, but hospital location, teaching status, and type did not affect survival. Payer status and income quartile did not affect survival.

Conclusions: PDA and SL are more common in lower BW and GA groups. Higher survival rates are found for infants with SL *versus* non-SL in the lowest BW and GA groups. Morbidity and mortality are not affected by SL timing. BW, rather than GA, determines survival of infants undergoing SL.

1. Introduction

Patent ductus arteriosus (PDA) is found in approximately 57 of every 100,000 live term births in the United States [1]. With prematurity, the incidence rises dramatically as up to 65% of preterm (PT) infants born at <30 wk gestation with respiratory difficulty have been shown to have a PDA on the fourth day of life [2,3]. Prematurity presents several challenges in an infant diagnosed with PDA. In comparison with term infants, those born prematurely have (1) physiological forces that promote patency of the ductus, (2) a higher incidence of comorbidities, including respiratory distress or congenital anomalies, and (3)

* *Corresponding author*. Division of Pediatric Surgery, Department of Surgery, University of Miami Miller School of Medicine, 1120 NW 14th Street, Suite 450, Miami, FL 33136. Tel.: +1 305 243 2247; fax: +1 305 243 5731.
E-mail address: EPerez3@med.miami.edu (E.A. Perez).
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are less likely to be optimal surgical candidates for a variety of reasons [4,5]. Therefore, significant controversy surrounds the decision on whether to proceed with medical therapy or surgical ligation (SL), their respective timing, and whether to intervene at all [2,6–11].

Prolonged PDA has been associated with a wide range of complications, from bronchopulmonary dysplasia to necrotizing enterocolitis (NEC), and has raised questions regarding the optimal timing of SL, if indicated [6–9]. Studies of clinical outcomes after SL have examined pneumothorax, vocal cord paralysis (VCP) due to recurrent laryngeal nerve injury, and mortality [5,8,9,12,13]. Thus far, studies have been based on institutional or multifacility treatment network cohorts with few exceptions [11,13]. A recent investigation drawing from the US national experience has yet to be performed. This study represents the largest analysis describing clinical outcomes, including potential complications and risk-adjusted mortality, for premature infants diagnosed with PDA undergoing SL and non-SL therapy.

2. Materials and methods

The Kids' Inpatient Database (KID) was used to identify cases of premature infants diagnosed with PDA for this analysis. The KID is a national database sampling admissions of pediatric patients in the US available from the Healthcare Cost and Utilization Project sponsored by the Agency for Healthcare Research and Quality. Approximately 2–3 million admissions are included in each triennial release. The datasets included are derived from the 1997, 2000, 2003, 2006, and 2009 releases.

Infants with PDA were established using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code 747.0 and SL using the code 38.85. Infants with PDA without SL were classified as non-SL or medically managed. Gestational age (GA), birth weight (BW), and prematurity data were derived from codes 765.0× (extreme immaturity), 765.1× (PT birth), and 765.21–765.28 (premature

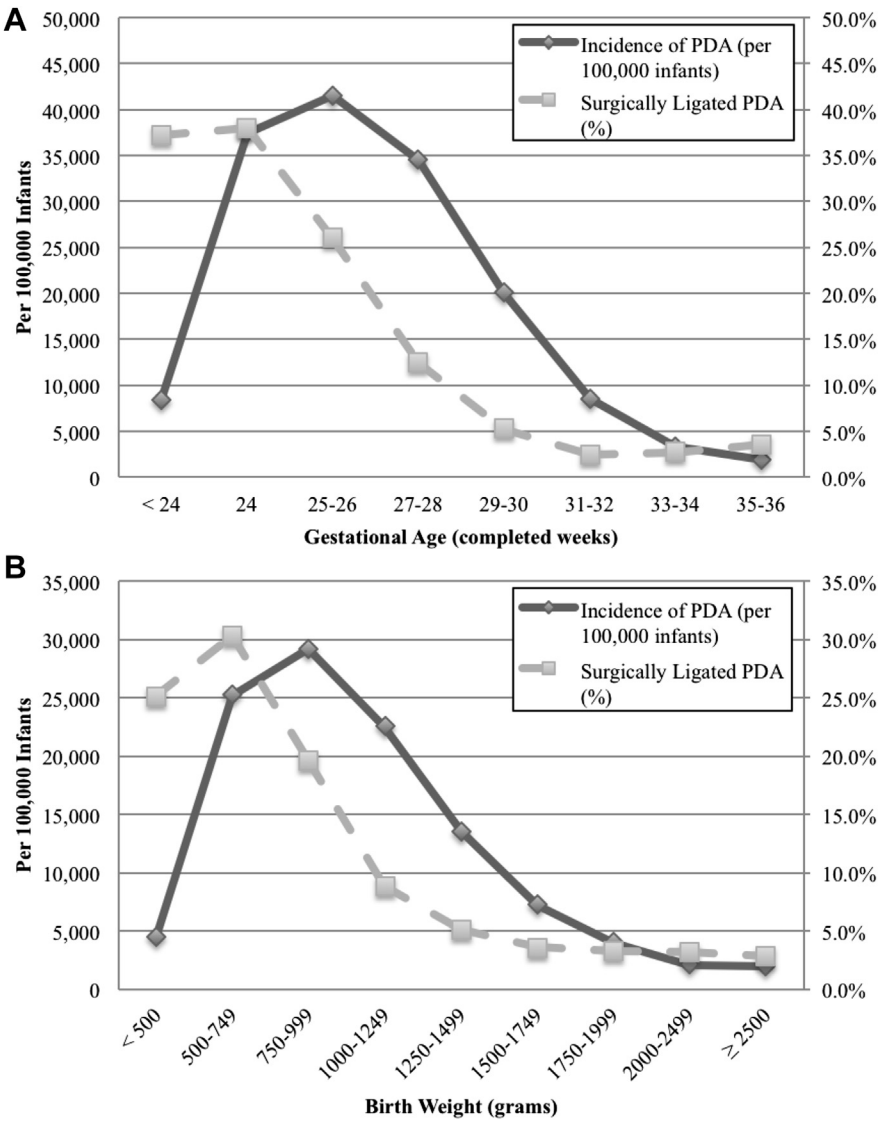

Fig. 1 – PDA incidence per 100,000 infants in study dataset and percentage undergoing SL stratified by (A) GA, 2003–2009 and (B) BW, 1997–2009.