

Complications associated with anemia in neonatal surgery

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INTRODUCTION

- Anemia serves as an indicator of overall health and may signify various underlying conditions such as nutritional deficiencies, excessive blood loss, and malignancies.
- In children >1 year of age undergoing surgery, pre-operative anemia has been associated with greater risk of in-hospital mortality.
- We used a national registry to explore the association between anemia and postoperative complications in patients <1 year of age undergoing pyloromyotomy.

METHODS

- Patients age <1 year of age undergoing pyloromyotomy during 2013-2015 were identified in the National Surgical Quality Improvement Program-Pediatric registry.
- Using previous population-based data, we defined preoperative anemia in term (≥ 37 weeks gestation) infants age ≥ 4 weeks up to 1 year as hematocrit (Hct) $\leq 30\%$. We excluded patients <4 weeks of age, patients born prematurely, and patients receiving perioperative blood transfusions.
- The primary outcome was any surgical complication including wound complications, surgical site infections (SSIs), cardiac arrest, reintubation, urinary tract infection, pneumonia, renal failure, neurological complications, reoperation, unplanned readmission, hospital stay >30 days, and 30 day mortality.
- We also examined wound complications (including SSIs) alone. Complication rates were compared by anemia status using Chi-square or Fisher's exact tests.

Table. Characteristics and outcomes of patients undergoing pyloromyotomy according to anemic status (N=1,832)

Characteristics	Anemic patients (N=297)	Non-anemic patients (N=1,535)	P value
	N (%) or Median (IQR)	N (%) or Median (IQR)	
Outcomes			
Any complication	15 (5%)	74 (5%)	0.883
Wound complication or SSI	2 (1%)	22 (1%)	0.408
Characteristics			
Female	53 (18%)	285 (19%)	0.769
Age (days)	45 (38, 58)	40 (33, 52)	<0.001
Weight (kg)	4 (4, 5)	4 (4, 5)	0.002
Race			
Non-Hispanic white	191 (74%)	931 (71%)	0.019
Non-Hispanic black	18 (7%)	168 (13%)	
Other	49 (19%)	205 (16%)	
ASA status			
1	62 (21%)	325 (21%)	0.677
2	190 (64%)	1,010 (66%)	
3-5	44 (15%)	199 (13%)	
Operative time (minutes)	26 (21, 34)	26 (20, 35)	0.870
Nutritional support	10 (3%)	20 (1%)	0.016
Cardiac risk factors	13 (4%)	42 (3%)	0.137
Minimally invasive procedure	201 (68%)	997 (65%)	0.366

ASA = American Society of Anesthesiologists, IQR = interquartile range, SSI = surgical site infection

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RESULTS

- The database included 1,832 patients 4 weeks to 1 year of age who underwent pyloromyotomy and had a preoperative Hct recorded (1,494/338 male/female; age 46 ± 21 days; weight 4 ± 1 kg; Hct $35 \pm 5\%$, obtained 1 ± 3 days before surgery).
- 297 patients were anemic. On bivariate analysis, the complication rate did not differ between anemic (5%) and non-anemic (5%) patients (Table; $p=0.883$).
- The rate of wound complications was 1% ($n=24$) and did not differ by anemia status on bivariate analysis ($p=0.408$).

DISCUSSION

- Anemia is a symptom of several conditions and has been shown to predict postoperative complications including an increased risk of in-hospital mortality in children >1 year age.
- Perioperative blood transfusion has been associated with increased risk of wound complications.
- Our analysis of a common neonatal surgery suggests that, in children <1 year of age, shows that preoperative anemia is not associated with surgical complications.
- This finding may be related to the transitory nature of anemia in neonates, or to age-based differences in the definition of anemia. The null association between anemia and surgical complications in this cohort raises the question of whether an age threshold exists below which preoperative anemia may not influence outcomes of common pediatric surgeries.