Analysis of procedural complications from diagnostic and therapeutic catheterizations performed on low birth weight infants ≤ 2.5 kg compared to infants > 2.5 kg

Meghan Chlebowski[1,2], Richard Stroup[2], Stephen Kaine, MD[1,2]

[1]University of Missouri-Kansas City School of Medicine [2]Children's Mercy Hospital - Kansas City, MO

UMKC School of Medicine

BACKGROUND

- The increased survival of low birth weight infants (< 2,500 g) with congenital heart disease has led to an increase in diagnostic and therapeutic cardiac catheterizations for these patients.
- There is concern over the increased risk that low birth weight poses in regards to the incidence of complications from these procedures.
- Reports from Taiwan, the UK, and Germany have examined such risk but have been limited by lack of controls [1,2,4].
- United States studies have effectively compared both low birth weight infants to a control group but were limited by a low number of subjects [3,5].
- There is a lack of moderate sized case-control reviews examining the effect of low birth weight on complication incidence.

METHODS

- A literature search was performed using PubMed and Google Scholar back to 1985 with the search terms "cardiac catheterization", "complications", and "low birth weight".
- From 01/03 to 01/09, infants ≤ 2.5 kg at the time of the first procedure were identified and compared to a randomly selected 3:1 case control of infants weighing > 2.5 kg at the time of the first procedure.
- Electronic medical records and angiography reports were reviewed
  - Demographic and procedural data was collected (Table 1).
  - Major and minor complication data was collected (Table 2).
- Data not displayed included the primary diagnosis due to wide variability.
- All data was analyzed using SPSS
- A p value of < 0.05 was determined to be significant

	≤ 2.5 kg	> 2.5 kg
Total (*N*)	46	136
Males	24	88
Females	22	48
Gestational Age (weeks)		
Mean	36.0	38.5
Median	36	39
Standard Deviation	1.99	1.48
Age at Catheterization (days)		
Mean	5.7	5.6
Median	5	3
Standard Deviation	4.70	6.41
Birth Weight (kg)		
Mean	2.26	3.28
Median	2.3	3.3
Standard Deviation	0.238	0.463
Diagnostic Interventions	28	62
Therapeutic Interventions	18	74
Balloon Atrial Septostomy	11	43
Balloon Valvuloplasty	7	31
Fluoroscopy time (min)		
AP	11.7	11.3
Lateral	5.2	5.0
Unpaired T-test (p =)*	0.48	
Contrast Amount (cc/kg)		
Mean	5.23	4.61
Median	2.25	1.25
Unpaired T-test (p =)	**0.023**	
Pre-BUN		
Mean	13.2	11.6
Median	7.01	7.23
Post-BUN		
Mean	16.4	12.2
Median	13.4	8.48
Unpaired T-test	**0.039**	
Pre/Post BUN *Paired T-test (p =)*	**0.05**	0.27
Pre-Cr		
Mean	0.68	0.69
Median	0.22	0.26
Post-Cr		
Mean	0.73	0.69
Median	0.27	0.26
Pre/Post Cr *Paired T-test (p =)*	0.90	0.24

Table 1. Analysis of demographic data and other catheterization variables. *Unpaired T-test denotes independent samples test between study group and control with equal variances assumed. Paired T-test denotes comparison within either group.

	≤ 2.5 kg	> 2.5 kg	*p* value
MINOR			
Transfusion within 24 hr	9	13	0.069[+]
Hypotension req. IVF	4	0	**0.015***
DVT	0	1	1.000*
Metabolic acidosis req. bicarb	1	1	0.441*
Transient heart block	3	2	0.102*
Dysrhythmias req. treatment	3	11	1.000*
Balloon rupture	0	1	1.000*
Minor Total	20	29	
MAJOR			
CPR	2	0	
Complete heart block req. epi/pacer	0	2	
Structural injury from balloon	0	1	
Myocardial perforation	0	0	
Vessel perforation	0	0	
Death	0	0	
Major Total	2	3	
GRAND TOTAL	**22**	**32**	

Table 2. Incidence of minor and major complications by groups. [+]Denotes use of Pearson Chi-Square analysis *Denotes use of Fisher's Exact Test

RESULTS

- A total of 46 infants ≤ 2.5 kg and 136 infants > 2.5 kg underwent cardiac catheterization.
- The overall incidence percentage of procedural complications was higher in infants ≤ 2.5 kg compared to infants > 2.5 kg (35% vs 18%, p=0.015) due to a greater proportion of minor complications (35% vs 17%, p=0.011).
- In regards to minor complications, there was a greater incidence of hypotension requiring IV fluids in infants ≤ 2.5 kg (7% vs 0%, p=0.015).
- Infants ≤ 2.5 kg received more contrast volume (5.2 +/- 2.3 vs 4.6 +/- 1.3 cc/kg, p=0.023) and post-procedure BUN was higher (16.4 +/- 13.4 vs 12.2 +/-8.5 mg/dL, p=0.039).
- The percentage of infants having major complications was not higher in the ≤ 2.5 kg group (2.2% vs 2.2%).
- No procedural deaths occurred in either group.

Image 1. Interventional procedure in the cardiac catheterization lab at Children's Mercy Hospital.

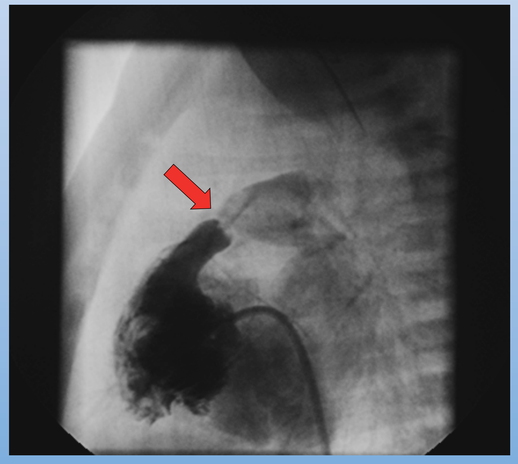

Image 2. Right ventricular angiogram from left lateral view demonstrating severe pulmonary stenosis (arrow) in an infant weighing 1.8 kg at Children's Mercy Hospital.

CONCLUSIONS

- Low birth weight infants ≤ 2.5 kg were at higher risk for procedural complications compared to larger infants > 2.5 kg
- The increased risk was associated with minor complications, particularly hypotension requiring IV fluids
- There was no difference in major complications.
- No procedural deaths occurred in either group.

LIMITATIONS

- Retrospective study limited by full disclosure of all complications and accurate input of data.
- Possibility of Type II error as a result of low power due to small *N*
- Data contributing to outcome but not included in this study: physician performing procedure, patient socioeconomic status, race, and ethnicity.

REFERENCES

(1) Chen MR, et al. Cardiac catheterization in low birth weight infants. J Formos Med Assoc 2005;104:408-11.
(2) Kretschmar O, et al. Interventional treatment of congenital heart defects in infants with a body weight up to 2,500 grams. Z Kardiol 2000;89:1126-32.
(3) McMahon CJ, et al. Cardiac catheterization in infants weighing less than 2500 grams. Cardiol Young 2003;13:117-22.
(4) Simpson JM, et al. Cardiac catheterization of low birth weight infants. Am J Cardiol 2001;87:1372-77.
(5) Sutton N, et al. Cardiac Catheterization in infants weighing less than 1,500 grams. Catheter Cardiovasc Interv 2006;68:948-56.