

Transcatheter Atrial Septal Defect Closure in an Infant with Bronchopulmonary Dysplasia and Pulmonary Arterial Hypertension

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Background

- The natural history of atrial septal defects (ASD) has been outlined in term infants, not in premature neonates.
- The physiologic consequences of left to right shunting may be detrimental in the premature neonate.
- Pulmonary over circulation pre-disposes to bronchopulmonary dysplasia (BPD) and pulmonary hypertension (PH).
- BPD and PH are a major cause of morbidity and mortality in premature neonates

Clinical History

- Prior 25^{5/7} weeks gestation.
- Birth weight: 740 grams
- Hemodynamic catheterization weight = 3.67kg
- Cardiac catheterization for device placement weight = 4.2kg
- **Echocardiogram** (day of life 4)
 - 2mm secundum ASD
 - Small PDA with bidirectional shunting (Indomethacin administered with successful closure)
- Extubated DOL 2, received x2 doses of surfactant
- Unable to wean from positive pressure ventilation (over 3 months)
- **Echocardiogram** (3 months)
 - Large secundum ASD with mild/moderate right ventricular enlargement
 - Interventricular septal flattening and concern for PH
- Transferred for Cardiac Catheterization demonstrating transpulmonary gradient of 17mmHg and RVSP 34mmHg (65% of systemic blood pressure) responding to increased FiO2

Figure 1: Before intervention

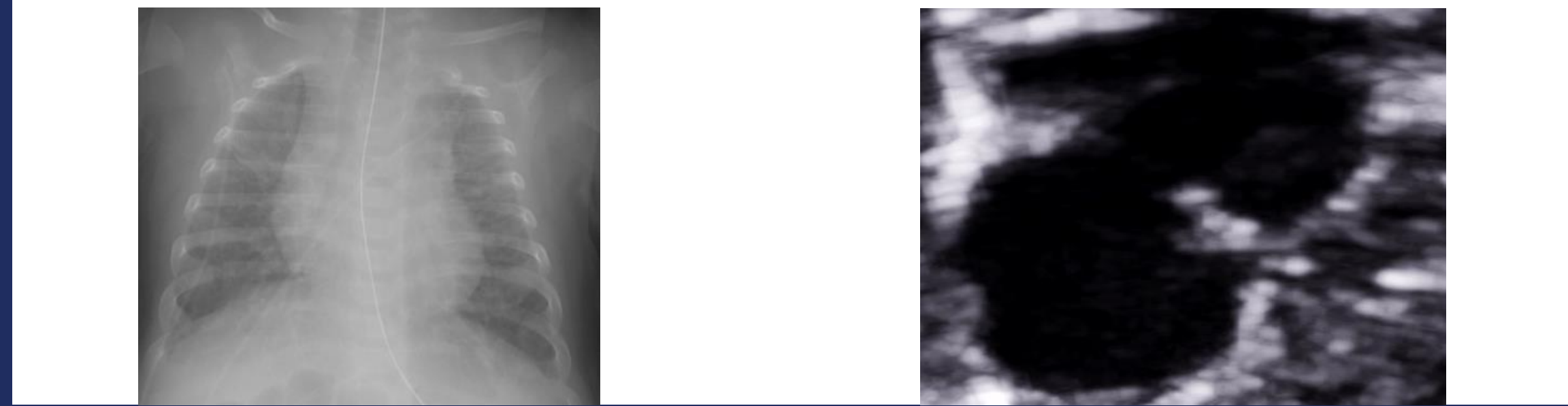
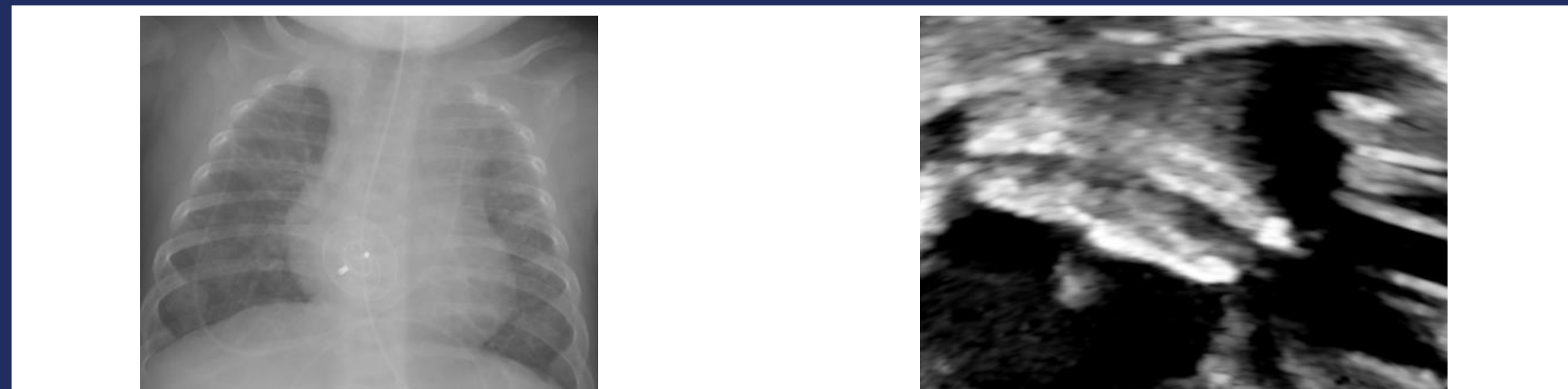


Table 1: Cardiac Catheterization

Parameter	Cardiac Catheterization #1	Cardiac Catheterization #2
HR	130	130
Systolic Blood Pressure	78/44	72/40
Mean PA Pressure	22mmHg	---
Qp:Qs Baseline	1.4:1.0 on CPAP 12/25%	1.8:1.0 on CPAP 16/30%
Qp:Qs with therapy	1.8:1.0 on FiO2 100%	---
PVR	5.7WU*m ²	---
PVR with therapy	2.6WU*m ²	---
Sheath Size	4Fr LFFV	8Fr RFV, 2Fr LFA
Total Procedure Time	3h5min	4h38min
Sedation Medication	Dexmedetomidine	Dexmedetomidine

Figure 2: Status post device closure



Clinical Course

Cardiac Catheterization #1

- Sildenafil started 0.5mg/kg/dose
- Worsening of respiratory support and concern for pulmonary over circulation (CPAP 16/30%)
- Pulmonary hypertension physiology vs. shunt physiology

Cardiac Catheterization #2

- Transcatheter ASD closure (10mm ASO)
- Diuretic therapy optimized (Lasix and Diuril)

Echocardiogram (4 months, s/p ASD closure)

- Moderate TR, eRVSP 55mmHg (73% SBP)
- Sildenafil restarted (0.5mg/kg/dose)
- Rapidly weaned from respiratory support
- On room air within 14 days
- Full PO feeds by 21 days and successful discharge home.

Conclusion

- The premature neonatal population with left to right shunting is a unique physiologic substrate.
- Atrial level shunting may have a greater impact in the setting of prematurity associated lung disease.
- ASD device closure may be a safe and effective way to eliminate left to right shunting in the neonatal population.
- Alternative criteria for recommending ASD closure may be needed in this unique patient population.