

Antenatal Risk of Coarctation for Newborns in Hartford (ARCH) Score: **A Predictor of Postnatal Management Strategy**

Alicia Wang, MD^{1,2}; Elizabeth Flerlage, DO, PGY-3^{1,2}; Matthew Cummins, MD, PGY-2^{1, 2}; Brooke T. Davey, MD^{1, 2} ¹University of Connecticut School of Medicine; Farmington, CT, ² Connecticut Children's; Hartford, CT

BACKGROUND

- **Coarctation of the Aorta (CoA)**
- 0.3 per 1000 live births
- Prenatal diagnosis of critical CoA is optimal for delivery planning at a tertiary center to decrease morbidity and mortality
- Patency of the ductus arteriosus and maternal-fetal circulation makes prenatal diagnosis difficult
- **ARCH Clinical Pathway (2014)**
- Developed to risk stratify fetuses with suspected COA and provide safe, effective and consistent care
- Prenatal Score assigned based on clinical suspicion and guides postnatal management (Table 1)

OBJECTIVE

• The purpose of this study is to evaluate the safety and efficacy of the ARCH scoring system in neonates with suspected CoA.

METHODS

- Single center retrospective chart review
- Groups
 - Group A: Before ARCH score
 - Group B: After ARCH score
 - Further divided into presence (1) or absence (2) of critical CoA
- Inclusion Criteria
 - Mothers carrying fetuses with suspected CoA between July 2004-July 2021
 - Prenatal evaluation at Connecticut Children's demonstrating suspicion for CoA
- **Exclusion criteria**
 - Additional structural cardiac disease that required neonatal intervention

ARCH SCORE



Instructions for newborn care and ARCH Score	reconsider
visit	

			î		
Level 1: High Suspic	Level 2: tion Moderate- High	Level 3: Moderate-low	Level 4: Low Suspicion		
 Admit to NIC Stat cardiolo consult and on service cardiologist Stat echocardiog 	CU • Admit to NICU ogy • Order routine cardiology consult and page on service cardiologist • Routine echocardiogram	 Admit to NICU Routine cardiology consult Routine echocardiogram 	 Admit to newborn nursery Contact on service cardiologist regarding timing of consultation (inpatient vs outpatient) 		
Access: Insert umbili lines Order PGE1 mcg/kg/min to delivery to ASAP	ical Access: • Insert umbilical lines 0.01 • Order PGE1 0.01 prior ostart delivery to be available at bedside	 Access: Insert PIV Do not order PGE1 unless clinically indicated 	 Access: No access indicated Do not order PGE1 unless clinically indicated 		
Labs and Monit Pre/post saturations Q2h: 3 or 4 extremity BP Q2h: femoral pulse check Q2h: AG, lac	toring: Labs and Monitoring: • Pre/post saturations • Q2h: 3 or 4 extremity BP's • Q2h: femoral pulse check • Q4h: AG, lactate ctate	 Labs and Monitoring: Pre/post saturations Q4h: 3 or 4 extremity BP's Q4h: femoral pulse check Q8h: AG, lactate 	 Labs and Monitoring: Pre/post saturations QShift: 3 or 4 extremity BP's QShift: femoral pulse check 		
Feeding: • NPO • IVF @ 100 ml/kg/day	Feeding:	Feeding: ・ Ad lib PO	Feeding: • Ad lib PO		
	After delivery: Cardiology assessment and hospitalizations course				

determines critical or non-critical CoA

Table 1: ARCH Score Pathway

ARCH SCORE OUTCOMES

	Arch Score 1,2	Arch Score 3,4	All
Non- critical CoA	12 (26.7%)	33 (73.33)	45 (100%)
Critical CoA	8 (80.0%)	2 (20.0%)	10 (100%)
All	20 (36.4%)	35 (63.6%)	55 (100%)

* Statistically significant with Chi Square (p=0.002) and Fisher's Exact test (p=0.0028)

RESULTS



CoA Diagnosis 40 29 30 23 20 10



Critical CoA vs ARCH Score



RESULTS

Treatment	Group A1	Group B1	p- value	Group A2	Group B2	P-value
Transfer from OSH	13/23	1/10	0.021	3/30	2/45	0.383
NICU admission	23/23	10/10	1.0	21/30	31/44	1.0
Days until diagnosis (n, mean (std dev) days)	1.957 (1.894)	1.9 (1.912)	0.938	28, 2.381 (2.294)	43, 3.814 (2.684)	0.101
NICU days until diagnosis (n, mean (std dev) days)	15, 2.067 (2.282)	8, 2 (2.0)	0.943	21, 2.381 (1.564)	31, 3.387 (2.246)	0.063
Number of Echos until diagnosis (n, mean (std dev) days)	23, 1.435 (0.788)	10, 1.7 (0.675)	0.338	29, 1.586 (0.946)	45, 2.133 (1.408)	0.049
Umbilical Line placement	20/21	9/9	1.0	6/30	17/44	0.125
Use of PGE	20/23	10/10	0.536	1/30	4/44	0.642
PGE time prior to treatment (hours)	14, 25.4 (46.3)	10, 3.9 (6.85)	0.111	1, 2.0	4, 3.25	
Intubation	2/22	1/10	1.0	1/30	4/44	0.642
Inotrope use	3/22	0/10	0.534	0/29	0/44	1.0
Acidosis	3/16	4/8	0.167	-	-	-
Lactate obtained	3/23	9/10	<0.001	-	-	-
LFTs drawn	3/19	2/9	1.0	-	-	-
Abnormal LFTS	2/3	1/2		-	-	-
Coags drawn	6/18	2/9	0.676	-	-	-
Abnormal Coags	6/11	2/11	0.183	-	-	-
NPO status	22/23	10/10	1.0	10/29	21/44	0.335

Table 2: Invasive procedures for critical and non-critical CoA pre vs post ARCH score

- Total of 108 participants (Figure 1)
- **Before ARCH Score initiation (Group A)**
- 53 infants in cohort
- 22 infants diagnosed with critical CoA (Group A1) postnatally
- After ARCH Score Initiation (Group B)
- 55 infants in cohort
- postnatally
- No significant demographic differences between the groups (Maternal age, ethnicity, birth weight, gestational age, fetal visit number, extracardiac abnormality)
- Postnatal transfer of care (Table 2)
- <0.001)
- Use of ARCH score decreased transfer of care for infants with critical CoA (p < 0.05)
- Invasive procedures and NICU admissions (Table 2)
 - The number of echocardiograms and lactates obtained was different between groups
 - There was no significant difference in NICU admissions, central line access, intubation, lab frequency or other invasive procedures between groups
- Prenatal high-risk categorization (Arch 1,2) is highly associated with postnatal risk of critical CoA (Figure 2, Table 3)

- Prenatal risk stratification system for CoA is safe and reliable
- The ARCH score can help guide management of patients with critical CoA
- The ARCH score identifies targets for resource utilization without compromising patient safety





RESULTS

• 10 infants diagnosed with critical CoA (Group B1)

30.2% transferred in group A vs 5.5% in group B (p

CONCLUSIONS