



Background

- Coarctation of the Aorta (CoA) and Interrupted Aortic Arch (IAA) are congenital heart defects that require cerebral protection strategies during infant corrective surgery, including selective cerebromyocardial perfusion (SCMP).
- We aimed to analyze the neurodevelopmental outcomes of patients with CoA and IAA and to evaluate their longitudinal course.

Methods

- It was a prospective cohort study** (Sep. 2024 ~ Dec. 2025) which enrolled the patients who underwent corrective surgery within 100 days
- Case group (n=14):** patients with CoA or IAA who used the cerebral protection strategies
- Control group (n=15):** patients with other cardiac disease without the use cerebral protection strategies
- Neurodevelopmental assessments 2 years of age were compared between the groups.**
 - Bayley Scales of Infant and Toddler Development, Fourth Edition (BSID-4)
 - Sequenced Language Scale for Infants (SELSI)
 - Korean version of the Child Behavior Checklist (K-CBCL)
- Longitudinal changes in BSID-4 composite scores were also analyzed at 1 and 2 years.**

Table 1. Baseline Characteristics of the Children who Underwent Neonatal Cardiac Surgery

	Case (n=14)	Control (n=15)	P
Age at enrollment (mo)	25.5 (25.1–25.8)	24.5 (24.2–26.1)	0.304
Male	7 (50%)	10 (66.7%)	0.742
Gestational age (wk)	38.9 (38.1–39.4)	38.6 (38.0–39.3)	0.416
Birth weight (kg)	3.15 (2.72–3.40)	3.18 (2.92–3.61)	0.244
Diagnosis			<0.001**
CoA	13 (92.9%)	0 (0%)	
IAA	1 (7.1%)	0 (0%)	
VSD	0 (0%)	13 (86.7%)	
Others	0 (0%)	2 (13.3%)	
Type of surgery			<0.001**
Anterior total repair	14 (100%)	0 (0%)	
VSD closure	0 (0%)	13 (86.7%)	
Others	0 (0%)	2 (13.3%)	
Age at surgery (d)	7 (6–9)	75.5 (48–84)	<0.001**
Duration of mechanical ventilation (d)	8.5 (6–13)	1.5 (1–3)	<0.001**
Intraoperative perfusion and ischemic time			
CPB duration (min)	165 (127–183)	89 (79–98)	<0.001**
Aortic cross-clamp duration (min)	65 (47–99)	62 (48.5–70)	0.677
Selective cerebromyocardial perfusion time (min)	22.5 (20–27)	N/A	N/A
Selective cerebral perfusion time (min)	16 (N/A)	N/A	N/A
Brain ultrasonography findings			0.048*
No definite abnormalities	4 (28.6%)	3 (20%)	
Germinal matrix hemorrhage	5 (35.7%)	0 (0%)	
Increased white matter echogenicity	2 (14.3%)	0 (0%)	
Others	3 (21.4%)	0 (0%)	

Numbers are n (%) or median (IQR). P value * < 0.05, ** < 0.01. VSD, ventricular septal defect; CPB, cardiopulmonary bypass.

Results

- When baseline characteristics were compared, the age at surgery (7 vs. 75.5 days), the duration of mechanical ventilation (8.5 vs 1.5), CPB duration (165 vs 89), brain ultrasonography findings were significantly different between the two groups (Table 1).

Table 2. Neurodevelopmental Outcomes at 2 Years of Age in Case and Control Groups

	Case (n=14)	Control (n=15)
Age (mo)	25.5 (25.1–25.8)	24.5 (24.2–26.1)
BSID-4		
Cognitive Composite Score	110.0 (105.0–110.0)	105.0 (102.5–110.0)
Language Composite Score	102.5 (100.0–110.2)	103.0 (95.0–108.0)
Motor Composite Score	102.0 (95.7–105.2)	101.0 (98.0–106.0)
SELSI		
Receptive Language Index	108.0 (100.0–111.1)	107.7 (101.9–108.5)
Expressive Language Index	106.0 (83.4–111.9)	108.3 (95.7–112.0)
K-CBCL		
Total problems	40.00 (17.25–61.50)	27.00 (9.50–49.50)
Internal problems	46.50 (28.00–62.50)	28.00 (11.50–44.00)
External problems	42.00 (17.00–51.50)	33.00 (8.00–52.50)
DSM-oriented scales		
Depression problems	44.00 (23.00–74.00)	44.00 (6.00–67.50)
Anxiety problems	41.00 (41.00–54.50)	26.00 (14.00–41.00)
Autism spectrum problems	58.00 (29.00–67.00)	45.00 (29.00–70.00)
ADHD problems	43.00 (17.00–70.50)	43.00 (14.00–60.00)
Oppositional defiant problems	40.00 (24.00–69.00)	40.00 (16.00–73.00)

Numbers are median (IQR).

- There were no significant differences between the two groups in BSID-4 composite scores, SELSI indices, or K-CBCL scores at 2 years of age (Table 2).
- Longitudinally, no significant changes in BSID-4 composite scores were observed between 1 and 2 years in both groups (Figure 1).

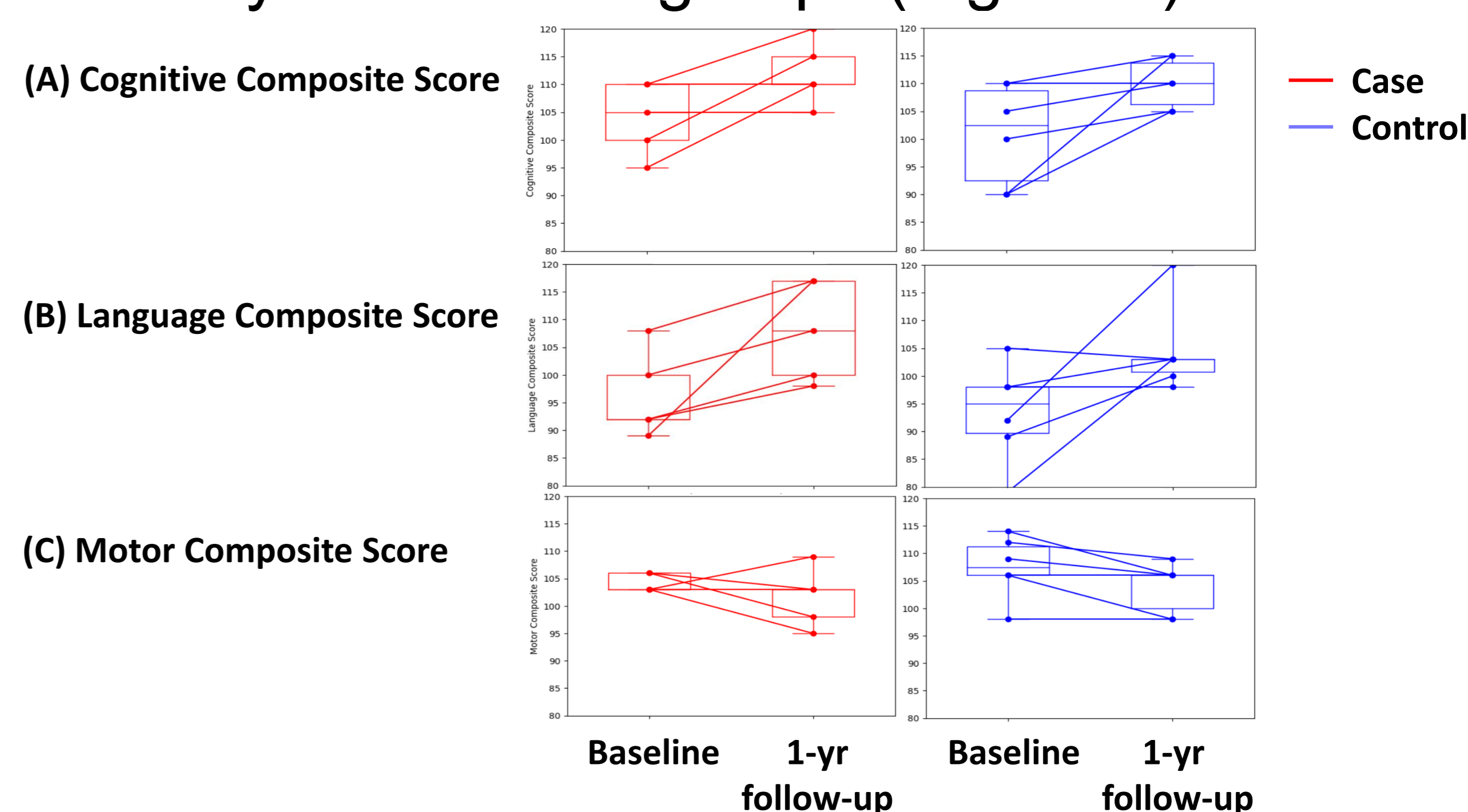


Figure 1. BSID-4 at 1 and 2 Years of Age in Case and Control Groups

Conclusion

- Neurodevelopmental outcomes were comparable between patients with congenital heart defects requiring cerebral protection strategies during corrective surgery and those who did not.
- These findings suggest that the use of cerebral protection strategies, including SCMP, does not adversely affect postoperative neurodevelopmental outcomes.

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