Short-Term Outcomes and Risk Factors for Requiring Extracorporeal Life Support After Norwood Operation: A Single Center Retrospective Study

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Background:

- Patients requiring extracorporeal life support (ECLS) after a Norwood operation constitutes an extremely high-risk group.
- Data regarding short-term and functional outcomes, and risk factors for requirement of ECLS post-Norwood operation are limited.

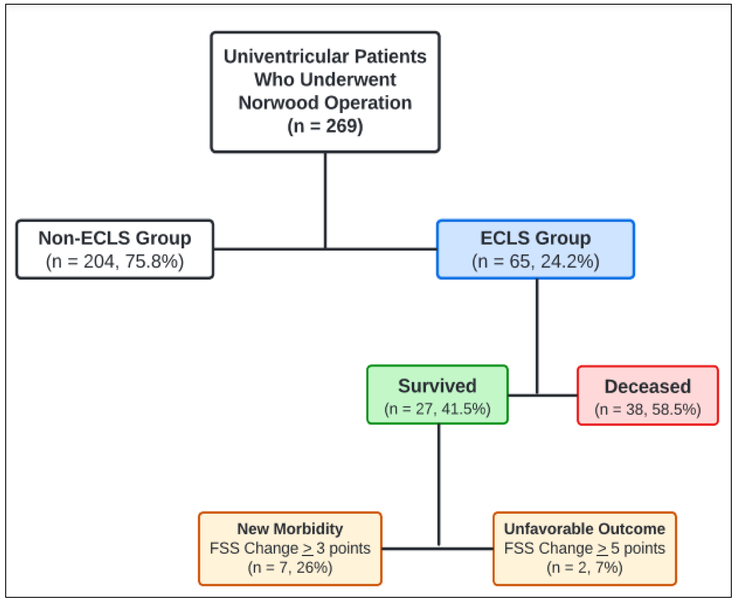
Methods:

- **Study Design:** Retrospective single center study.
- **Inclusion Criteria:** All patients with single ventricle (SV) physiology who underwent Norwood Operation from 01/2010 – 12/2020 (n = 269).
- Data included patient characteristics, demographics, operative variables, ECLS run details, and outcomes.

Conclusion:

- SV patients requiring ECLS following Norwood operation have a 43% survival rate.
- Of the survivors, 26% developed new morbidity and 7% developed unfavorable outcomes
- Patients with worse univentricular function in the preoperative transthoracic echocardiogram (TTE) and intraoperative transesophageal echocardiogram (TEE), delayed sternal closure, requirement of iNO and higher VIS scores in the immediate postoperative period, and required postoperative Cath had higher odds of requiring post-Norwood ECLS support.

Figure 1. Flow Chart of Entire Cohort who Underwent Norwood Operation Stratified by ECLS Requirement



Risk factors associated with higher odds of requiring ECLS support following Norwood operation are:

- **Ventricular dysfunction on preop TTE and intraop TEE**
- **Requirement of iNO, high VIS scores, and cardiac cath in the immediate postoperative period**

Disclosures: None

Results:

Table 1. Logistic Regression Examining the Association of Risk Factors and Post-Norwood ECLS Requirement

Variables	Univariable Analysis		Multivariable Analysis	
	Odds Ration	*P*-value	Odds Ration	*P*-value
Pre-Norwood TTE				
Systemic Ventricular Function				
Normal	Reference		Refence	
Mild Dysfunction	2.36 (0.84, 6.63)	0.103	1.52 (0.25, 9.31)	0.65
Moderate – Severe Dysfunction	9.80 (4.47, 21.52)	**<0.0001**	6.97 (1.51, 32.24)	**0.013**
Source of Pulmonary Blood flow				
Sano Shunt	Reference		Reference	
m-BTT Shunt	2.0 (1.12, 3.57)	**0.019**	2.65 (1, 7.01)	**0.05**
Type of Systemic Ventricle				
RV	Reference		-	-
LV	3.07 (1.32, 7.14)	**0.009**	-	-
Undetermined	0.19 (0.02, 1.42)	0.104	-	-
Intraoperative TEE				
AVVR				
No – Trivial – Mild AVVR	Reference		Reference	
Moderate – Severe AVVR	4.90 (2.14, 11.23)	**0.0002**	8.50 (2.17, 33.23)	**0.002**
Systemic Ventricular Function				
Normal	Reference		Reference	
Mild Dysfunction	3.52 (1.49, 8.31)	**0.004**	2.36 (0.59, 9.37)	0.224
Moderate – Severe Dysfunction	3.20 (1.22, 8.41)	**0.018**	0.41 (0.007, 2.36)	0.318
Cardiopulmonary Bypass Time (min)	1.13 (1.06, 1.2)	**<0.0001**	1.16 (1.05, 128)	**0.004**
Circulatory Arrest Time (min)	1.09 (1.04, 1.15)	**0.001**	1.20 (1.06, 1.36)	**0.003**
Post-Norwood iNO				
No	Reference		Reference	
Yes	3.66 (1.76, 7.63)	**0.001**	1.05 (0.31, 3.54)	0.937
Delayed Sternal Closure				
No	Reference		Reference	
Yes	3.8 (1.88, 7.69)	**0.0002**	3.86 (1.16, 12.81)	**0.028**
Post-Norwood VIS Score				
First 24 hours	1.30 (1.15, 1.47)	**<0.0001**	0.93 (0.66, 1.31)	0.679
Hours 24 – 48	1.54 (1.34, 1.76)	**<0.0001**	1.38 (1.02, 1.86)	**0.038**
Post-Norwood Cardiac Cath				
No	Reference		Reference	
Yes	10.79 (5.68, 20.52)	**<0.0001**	12.43 (4.38, 35.26)	**<0.0001**