ECMO (refractory shock)

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7. česko-slovenský kongres dětské intenzivní medicíny a anestézie. Brno 2011

ECLS Registry Report

International Summary

January, 2011

Extracorporeal Life Support Organization
2800 Plymouth Road
Building 300, Room 303
Ann Arbor, MI 48109

Overall Outcomes

	Total Patients	*Survived ECLS*		*Survived to DC or Transfer*	
Neonatal					
Respiratory	24,344	20,608	85%	18,276	75%
Cardiac	4,232	2,566	61%	1,663	39%
ECPR	640	403	63%	245	38%
Pediatric					
Respiratory	4,771	3,094	65%	2,656	56%
Cardiac	5,221	3,322	64%	2,502	48%
ECPR	1,220	646	53%	479	39%
Adult					
Respiratory	2,340	1,474	63%	1,261	54%
Cardiac	1,540	812	53%	598	39%
ECPR	516	201	39%	153	30%
Total	44,824	33,126	74%	27,833	62%

Centers

Extracorporeal membrane oxygenation for pediatric respiratory failure: Survival and Predictors of Mortality
Zabrocki LA et al.: Crit Care Med 2011;39:364-370
1993-2007; 3717 pacientů

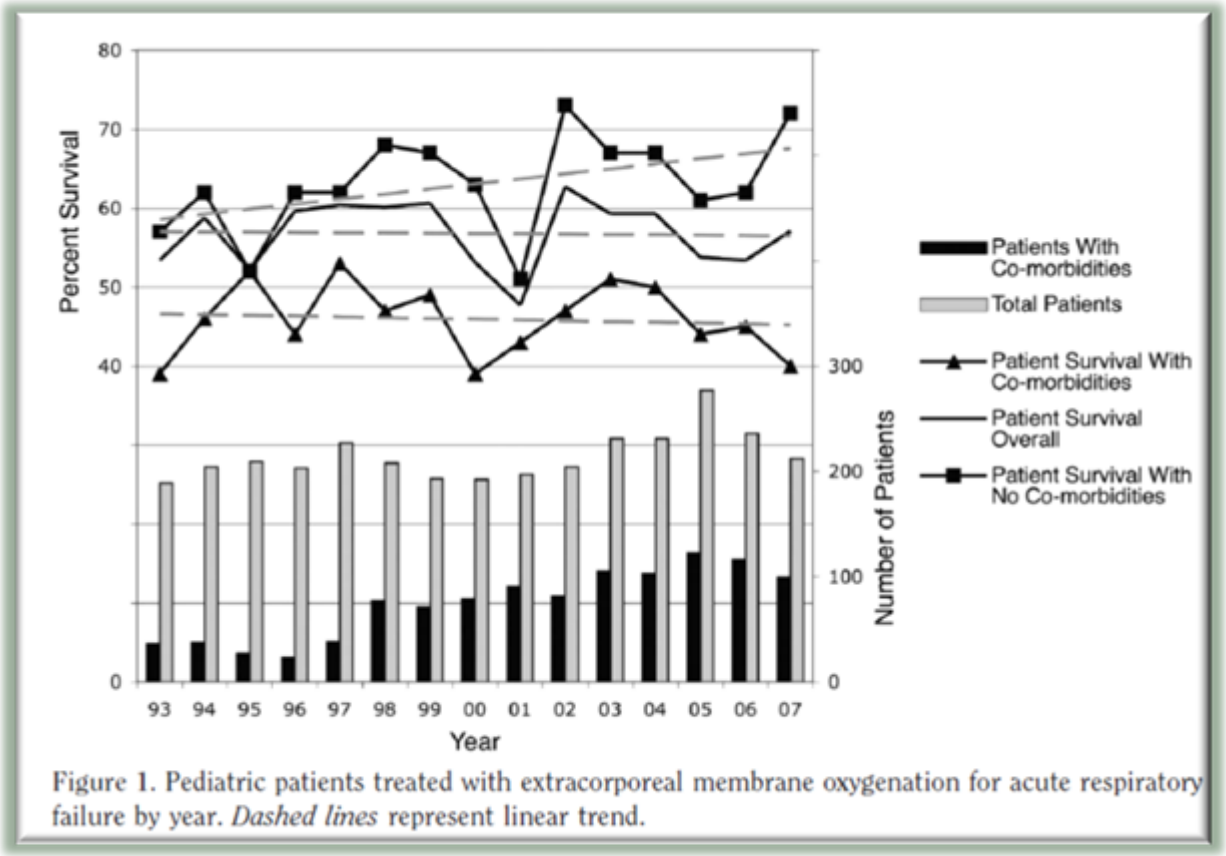


Figure 1. Pediatric patients treated with extracorporeal membrane oxygenation for acute respiratory failure by year. *Dashed lines* represent linear trend.

ECMO – indikace

Pediatrická indikační kritéria

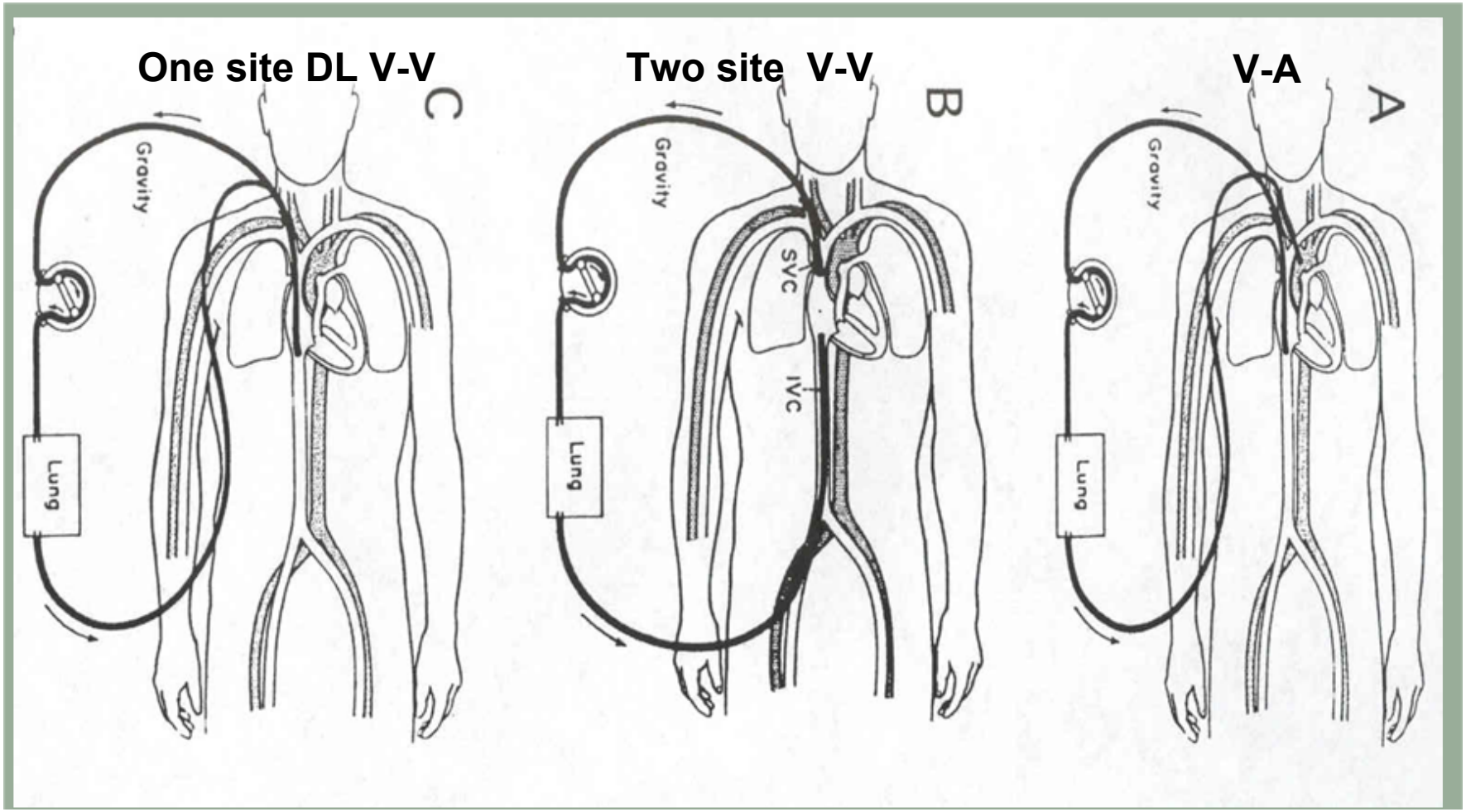
Doporučení:

- „ high levels of ventilation support“ během prvních 7 dnů UPV.
- oběhové selhání nezvládnutelné správně prováděnou oběhovou podporou
  - **PaO2 < 50 mmHg (po dobu 4 hod)**

Akutní deteriorace

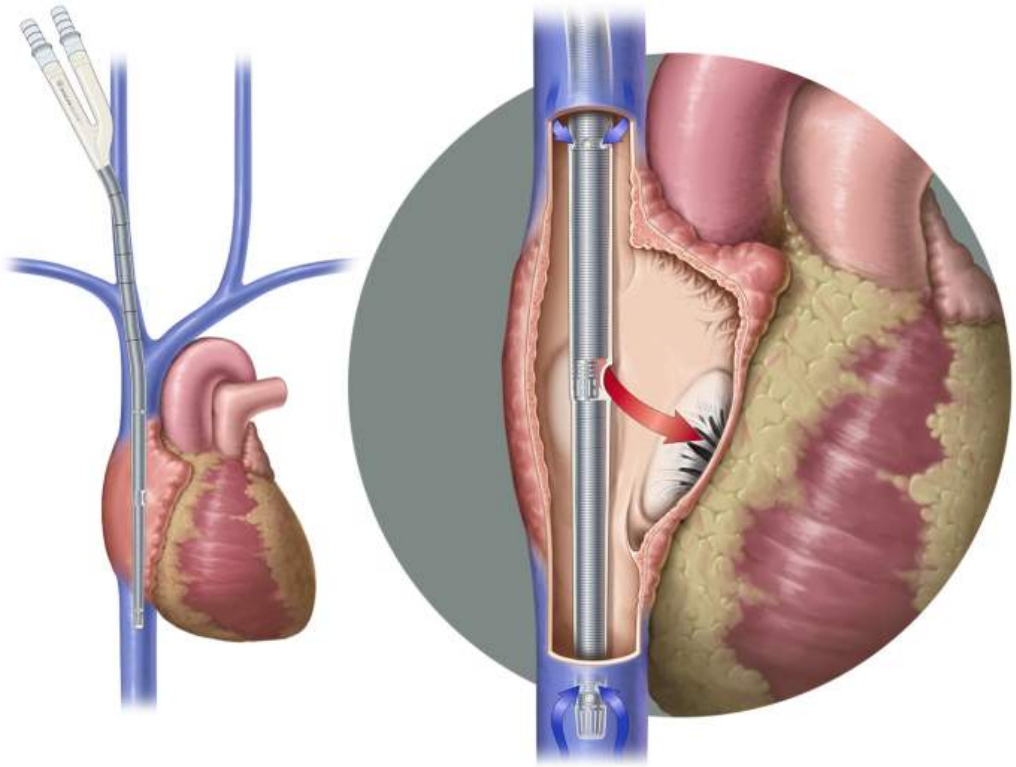
- **PaO2 < 40 mmHg (po dobu 2 hod)**
- **pH < 7.15 (po dobu 2 hod)**

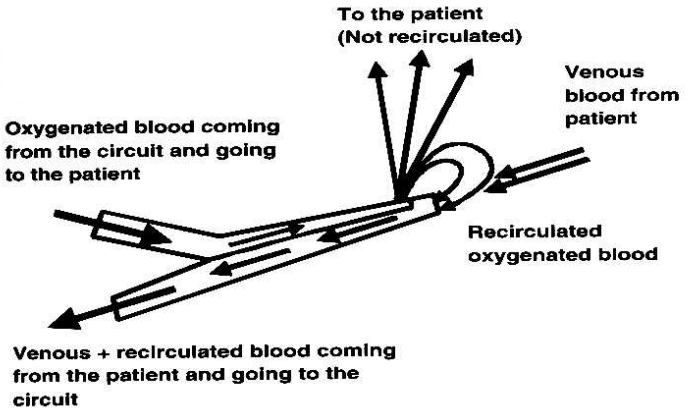
ECMO - modality

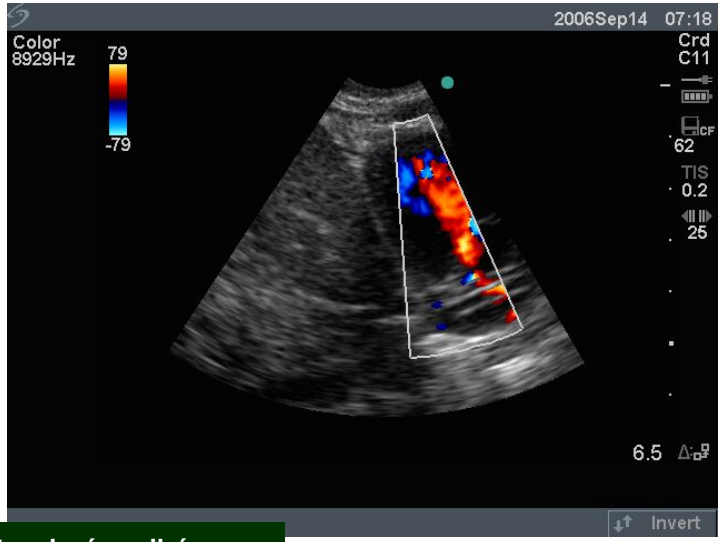


ECMO – srovnání V-V a V-A

V-V DL ECMO

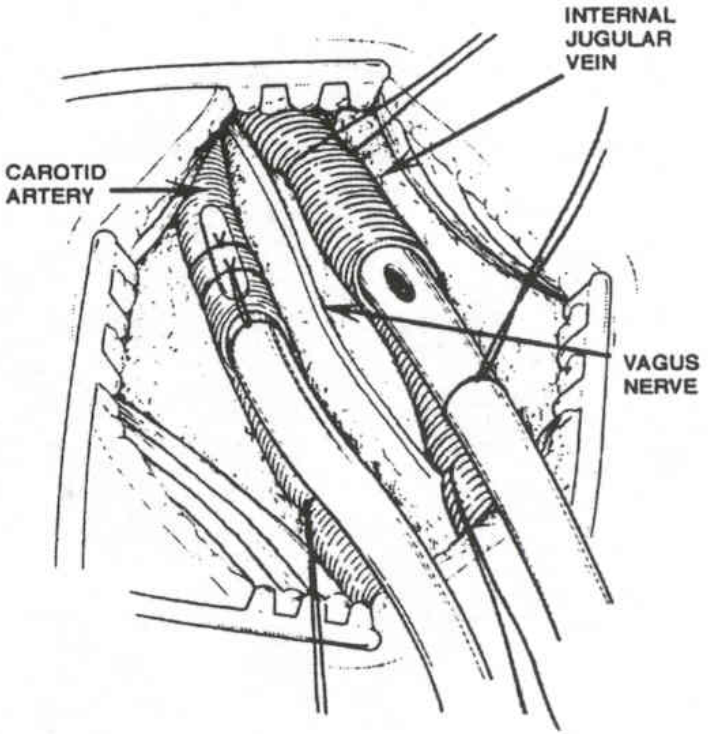


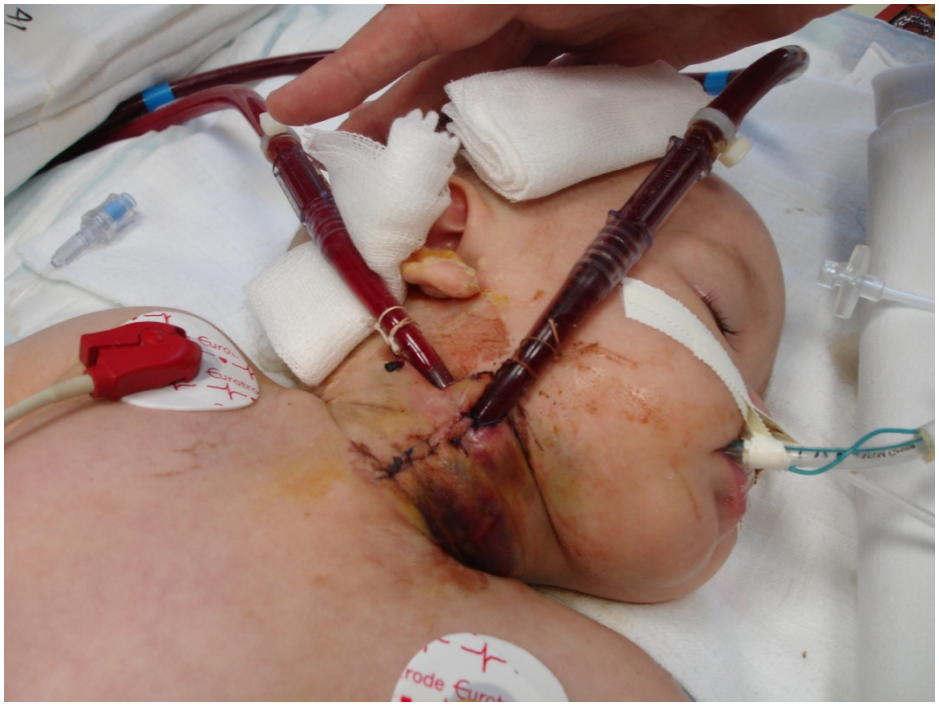




ECMO – srovnání V-V a V-A

V-A ECMO





ECMO – srovnání V-V a V-A

V-A ECMO - oběhové a respirační selhání
V-V ECMO - respirační selhání

	V-A	V-V
Kanylace	v.jugul.int. v. fem. → RA a.carotis com.→ aorta	v.jugul.int. v. fem. → RA
Dosažené pO2	60-150 torr	45–80 torr
Ovlivnění hemodynamiky	↓preload;↑afterload ↓pulse pressure variabilní CVP možnost omráčení myokardu	zanedbatelný efekt
Oběhová podpora	částečná až úplná	sekundárně zvýšením DO2
DO2	Vysoká	střední
Vliv na plicní cirkulaci	středně nebo významně ↓	beze změn, nebo sekundárně
Recirkulace	žádná	významná

Allan P Goldman, Steven J Kerr, Warwick Butt, Michael J Marsh, Ian A Murdoch, Thankam Paul, Richard K Firmin,Robert C Tasker, Duncan J Macrae
Extracorporeal support for intractable cardiorespiratory failure due to meningococcal disease
THE LANCET Volume 349, Issue 9050, 15 February 1997, Pages 466-469

	1	2	3	4	5	6	7	8	9	10	11	12
Age	2·7 yr	20 mo	8 mo	4 yr	5 mo	2·5 yr	15 mo	4 mo	5·2 yr	14 mo	18 yr	13 yr
Indication for ECMO	Shock	Shock	Shock	Shock	Shock	Shock	Shock	ARDS	ARDS	ARDS	ARDS	ARDS
PRISM pre ECMO	29	33	31	34	40	28	29	14	26	15	13	16
GMSPS pre ECMO	10	12	15	12	15	13	15	7	10	8	10	10
CPR pre ECMO	Yes	Yes	No	Yes	No	No	Yes	No	No	No	Yes	No
OI pre ECMO	30	4	69	49	29	5	37	53	46	75	60	58
A-aDO2 pre ECMO	473	189	610	619	614	197	523	510	576	688	714	599
PIP pre ECMO (cm H2O)	30	22	40	34	45	22	35	43	40	37	50	40
PEEP pre ECMO (cm H2O)	8	5	14	16	12	6	10	12	10	11	8	10
FiO2 pre ECMO	0·8	0·45	1·0	1·0	1·0	1·0	0·9	0·9	1·0	1·0	1·0	1·0
Outcome	Survived	Died	Died	Survived	Died	Survived	Survived	Survived	Died	Survived	Survived	Survived

Maclaren G, Butt W, Best D, Donath S, Taylor A

Extracorporeal membrane oxygenation for refractory septic shock in children: one institution's experience.

Pediatric Critical Care Medicine **Pediatr Crit Care Med. 2007 Sep;8(5):447-51.**

- **July 1988 - October 2006, 441 children received extracorporeal life support**
- **45 pat. (10%) with septic shock received V-A ECMO**
- **18 pat. (40%) of these had suffered cardiac arrest and were receiving chest compressions immediately before cannulation**
- **21 pat. (47%) patients survived to hospital discharge**
- **73% of those with central cannulation survived vs. 44% without, (*p = .05*)**
- **No survivors had severe disability at long-term follow-up**

- **This study adds support to existing guidelines.**

Mac Laren G, Butt W, Best D, Donath S. Central extracorporeal membrane oxygenation for refractory pediatric septic shock.

Pediatric Critical Care Medicine Pediatr Crit Care Med. 2011 Mar;12(2):133-6

- *Patients:* Twenty-three children with refractory septic shock who received central ECMO primarily as circulatory support.
- All patients had microbiological evidence of infection, and meningococcemia was the most common diagnosis.
- Twenty-two (96%) patients had failure of at least three organ system
- Eight (35%) patients suffered cardiac arrest and required external cardiac massage before ECMO
- Eighteen (78%) patients survived to be decannulated off ECMO, and 17 (74%) children survived to hospital discharge

CONCLUSIONS:

- Central ECMO seems to be associated with better survival than conventional ECMO and should be considered by clinicians as a viable strategy in children with refractory septic shock.

Brierley J, Carcillo JA, Choong K, Cornell T, Decaen A, Deymann A, Doctor A, Davis A, Duff J, Dugas MA, Duncan A, Evans B, Feldman J, Felmet K, Fisher G, Frankel L, Jeffries H, Greenwald B, Gutierrez J, Hall M, Han YY, Hanson J, Hazelzet J, Hernan L, Kiff J, Kissoon N, Kon A, Irazuzta J, Lin J, Lorts A, Mariscalco M, Mehta R, Nadel S, Nguyen T, Nicholson C, Peters M, Okhuysen-Cawley R, Poulton T, Relves M, Rodriguez A, Rozenfeld R, Schnitzler E, Shanley T, Kache S, Skippen P, Torres A, von Dessauer B, Weingarten J, Yeh T, Zaritsky A, Stojadinovic B, Zimmerman J, Zuckerberg A

Clinical practice parameters for hemodynamic support of pediatric and neonatal septic shock: 2007 update from the American College of Critical Care Medicine. Crit Care Med. 2009 Feb;37(2):666-88.

- **ECMO and CRRT therapy for refractory schock - Level II**
- **most centers accept refractory shock or a $PaO_2 < 40$ mm Hg after maximal therapy to by sufficient indication for ECMO**

Úmrtí na komunitní infekce v dětské věku v ČR

	2009	2010
IMO	6	5
IPO	15	2

7. česko-slovenský kongres dětské intenzivní medicíny
a anestézie. Brno 2011