Real Time Effort Driven Patient Ventilator Management Protocol for Children With ARDS (The REDvent Pilot Study)

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Argomento: Insufficienza respiratoria acuta e ventilazione meccanica

Introduction: Mechanical ventilation during Pediatric ARDS (PARDS) aims to minimize ventilator induced lung injury and ventilator induced diaphragm dysfunction.We sought to determine the potential benefit of a computer decision support tool (CDS tool) using esophageal manometry to target physiologic levels of patient effort for diaphragm protection, combined with modified rules from the ARDSnetwork for lung protection.

Methods: Phase 1, open label trial in children with PARDS. A CDS tool recommended ventilator changes <= Q4 hours.Acute phase management used a pressure control mode with a PEEP/FiO2 table, and rate and delta pressures based on targeting permissive hypercapnia, while maintaining effort of breathing (measured from esophageal manometry) in a target range if the patient was spontaneously breathing.Once the patient met weaning criteria, they had a Spontaneous Breathing Trial (SBT).Patients who failed the SBT were moved to the weaning phase which used a pressure support mode with 4 hourly adjustments to maintain effort of breathing in a target range. For outcome analysis, each patient was matched with 5 historical controls.

Results:Thirty-two patients were included. Median age was 8 years (IQR 2.8, 12.5), and initial Oxygenation Index (OI) was 21.6 (12.7, 29.7). Seven children died, 41% were immunocompromised. 128 matched historical controls were similar to protocol patients with respect to age, initial OI, and percentage of immune compromise. Patients treated with REDvent received lower delta pressures and tidal volumes, and higher PEEP when FiO2 was > 0.55 compared with historical controls (all $p<0.05$). Mortality was similar between groups ($p=0.5$) but REDvent was associated more VFDS (20 vs 14, $p=0.04$), shorter length of MV amongst survivors (6.6 vs 9.9 days, $p=0.04$), without difference in re-intubation ($p=0.1$).

Conclusions:A CDS tool prioritizing both lung and diaphragm protective ventilation may improve clinical outcomes. A Phase II randomized controlled trial is ongoing.

Variable	REDvent	Control	
	32	128	p
Age (mo)	100.7 (33.7,150.4)	70.3 (13.3,158)	0.45
Weight	34 (9.9,50)	17.3 (9.3,41)	0.2
Male	19 (59.4%)	67 (52.3%)	0.6
Initial OI	21.6 (12.7,29.7)	18.1 (10.7,27.7)	0.54
Immunosuppressed	13 (40.6%)	48 (37.5%)	0.9
Mortality	7 (21.9%)	37 (28.9%)	0.56
PEEP (FiO2 > 0.55)	**14(12,14)**	**11(8,13)**	**0.037**
Δ Pressure cmH_20	**16 (14,20)**	**20 (16, 22)**	**0.02**
PCO2 mmHg	**53 (46, 58)**	**47 (39, 56)**	**0.09**
Tidal Volume (ml/kg)	**5.9 (4.7, 7.5)**	**7.7 (6.5, 9.2)**	**0.0005**
Days to first SBT	**6 (4, 11)**	**11 (6, 28)**	**0.004**
28 D VFDs (days)	**19.9 (22.6,9.4)**	**14.1 (0,21.2)**	**0.039**
LMV Survivors (days)	**6.6 (4.38, 9.14)**	**9.92 (5.1,15.6)**	**0.043**
Re-intubation	**0 (0%)**	**10 (7.8%)**	**0.10**

Table 1: REDvent vs. historical controls