주최·주관 대한심장혈관흉부외과학회

2024 대한심장혈관흉부외과학회

제56차 추계학술대회

2024. 10. 31 (Thu) - 11. 01 (Fri) 여수 엑스포 컨벤션센터

Efficacy of Triple Cannulation in Veno-Venous ExtraCorporeal Membrane Oxygentation for Severe ARDS

공지사항

- 소속기관이나 저자명이 드러나지 않도록 해주세요.
- 제목 슬라이드 포함 최대 6장, Font size 20 이상
- PPT 파일 작성 후 PDF로 전환해서 접수(필수)

Purpose

- During the COVID-19 era, various veno-venous extracorporeal membrane oxygenation (VV ECMO) techniques have evolved, including the parallel circuit and oxyRVAD approaches. However, due to limitations in insurance coverage and equipment availability, excessive use of ECMO is not feasible. To optimize mechanical support with limited resources, we implemented the insertion of an additional oxygenated ECMO line.
- The study aimed to evaluate the efficacy and outcomes of an additional oxygenated line in VV ECMO circuits for patients with severe acute respiratory distress syndrome(ARDS).

<Parallel circuit>

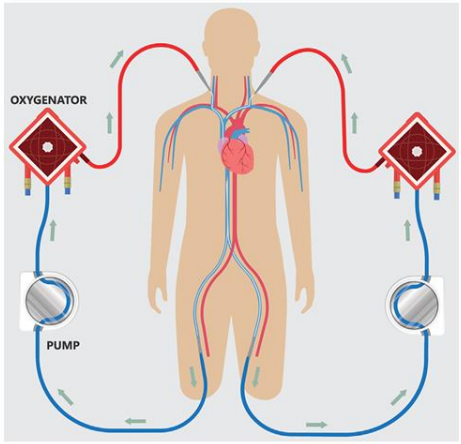
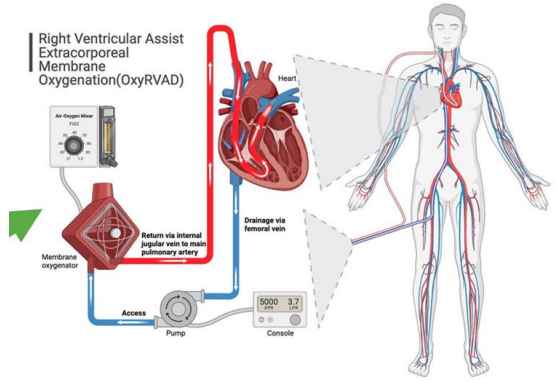


FIGURE 1. Parallel circuit cannulation for venovenous extracorporeal membrane oxygenation using bilateral femoral veins and bilateral internal jugular veins.
2024 Feb;167(2):746-754.e1. doi: 10.1016/j.jtcvs.2022.09.006.]

<oxyRVAD>

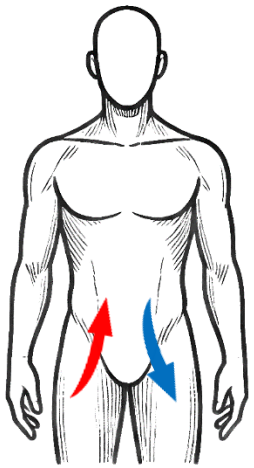


Grotberg *et al. Critical Care* (2023) 27:289
https://doi.org/10.1186/s13054-023-04572-w

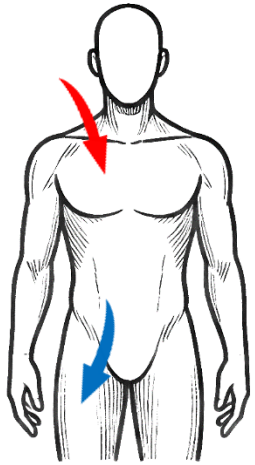
Methods

- Single-center retrospective observational study, conducted at a tertiary hospital from January 2018 to December 2023, involved 111 patients who received VV ECMO.
- After excluding those who were converted to VA ECMO, transferred, not intubated, or diagnosed with COVID-19, 35 patients remained: 27 received conventional VV ECMO, and 8 received triple cannulation VV ECMO(VVV ECMO).
- Baseline characteristics were compared using T-tests and Chi-square tests, and a repeated measures ANOVA was performed to assess changes in blood gas analysis (BGA) profiles over time.

<VV ECMO>

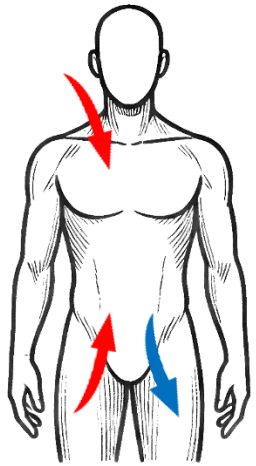


Femoral-femoral (n=17)

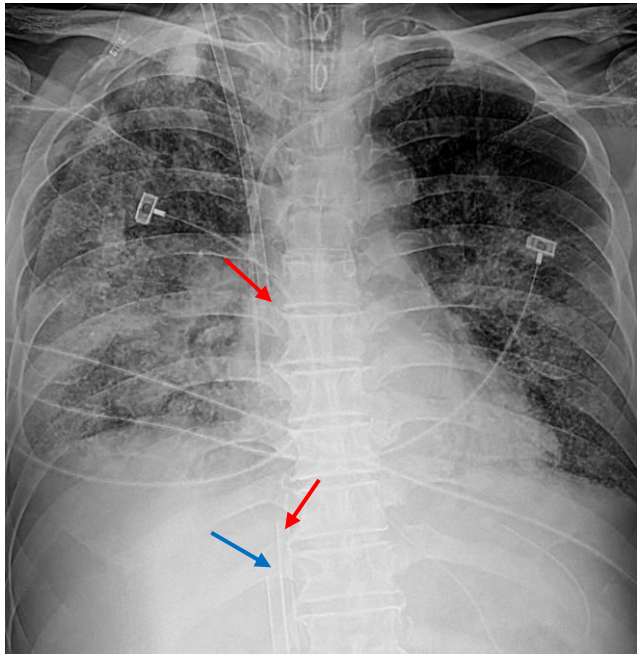


Femoral-Jugular (n=10)

<VVV ECMO>



Femoral-femoral-jugular (n=8)



Results

General characteristics					
Variable		All patients (N=35)	VV ECMO (N=27)	VVV ECMO (N=8)	P
Age, yrs, Mean ± SD		50.89 ± 16.0	48.5 ± 15.2	56.1 ± 17.8	0.247
Male		28 (80%)	22 (81.5%)	6 (75%)	0.687
BMI, Mean ± SD		25.4 ± 6.27	25.9 ± 6.9	23.4 ± 3.4	0.332
BSA, Mean ± SD		1.8 ± 0.25	1.82 ± 0.28	1.72 ± 0.17	0.366
APACHE II score		18.8 ± 6.7	18.3 ± 6.4	20.6 ± 7.9	0.407
Ejection fraction		64.7 ± 9.7	63.9 ± 9.4	67.6 ± 10.7	0.355
Comorbidities	DM	7 (20%)	5 (18.5%)	2 (25%)	0.687
	HTN	14 (40%)	10 (37%)	4 (50%)	0.511
	CAOD	5 (14.3%)	4 (14.8%)	1 (12.5%)	0.869
	CVA	4 (11.4%)	2 (7.4%)	2 (25%)	0.170
	Renal failure (GFR<60)	5 (14.3%)	1 (3.7%)	4 (50%)	0.001
	Liver disease	3 (8.6%)	2 (7.4%)	1(12.5%)	0.651
	Malignancy	6 (17.1%)	4 (14.8%)	2 (25%)	0.502

*BMI: body mass index, BSA : body surface area, CAOD: coronary artery obstructive disease, CVA: cerebrovascular accident

Primary outcomes				
Pump time (day)	20.4 ± 16.6	15.8 ± 14.1	34.3 ± 17.8	0.005
Initial pump flow	3757 ± 601.6	3696.1 ± 642.1	3987.5 ± 448.6	0.242
Hospital stay (day)	42.0 ± 54.1	66.0 ± 59.2	73.8 ± 39.1	0.729
ECMO weaning	25 (71%)	19 (70.4%)	6 (75%)	0.799
In hospital death	15 (42.9%)	12 (44.4%)	3 (37.5 %)	0.727

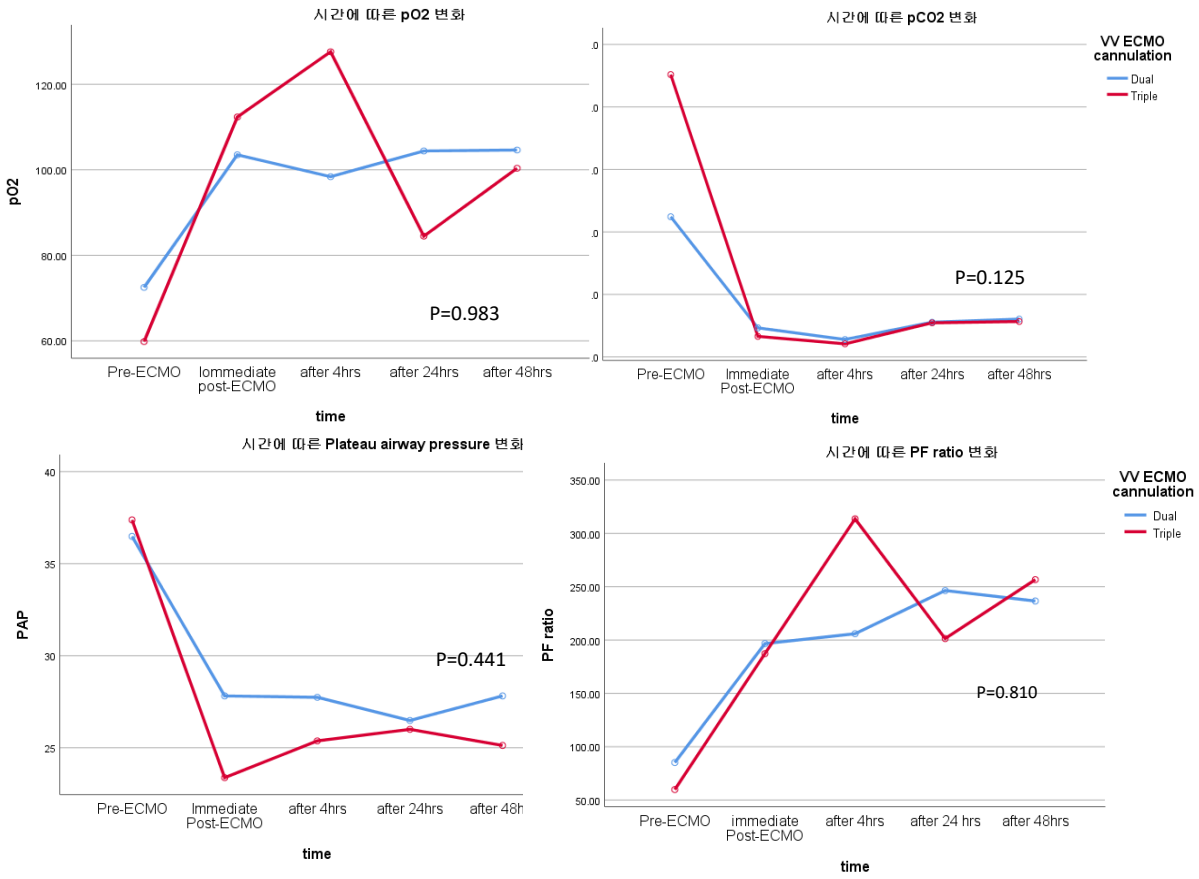
Complications				
	All patients (N=35)	VV ECMO (N=27)	VVV ECMO (N=8)	p
GI bleeding	4 (11.4%)	3 (11.5%)	1 (12.5%)	0.941
Hemothorax	4 (11.4%)	4 (15.4%)	0 (0%)	0.238
Denovo CRRT	8 (22.9%)	6 (23.1%)	2 (25%)	0.911
Arrhythmia	3 (8.6%)	3 (11.5%)	0 (0%)	0.314
Pneumothorax	4 (11.4%)	3 (11.5%)	1 (12.5%)	0.941
Pleural effusion	4 (11.4%)	3 (11.5%)	1 (12.5%)	0.941
Hyper bilirubinemia	3 (8.6%)	2 (7.4%)	1 (12.5%)	0.651
Hemolysis (including HIT)	3 (8.6%)	2 (7.7%)	1 (12.5%)	0.675
Brain hemorrhage	2 (5.7%)	2 (7.7%)	0 (0%)	0.419
Sepsis	4 (11.4%)	2 (7.7%)	2 (25%)	0.184
Any complications	22 (62.9%)	17 (63%)	5 (62.5%)	0.981

*HIT: Heparin induced thrombocytopenia, GI: gastrointestinal, CRRT: Continuous renal replace therapy

- There were no significant differences between the two groups in general characteristics and complications. Only the triple cannulation group had a higher incidence of renal failure with GFR ≤ 60 and significantly longer pump time.

Results

ECMO BGA profile		All patients (N=35)	VV ECMO (N=27)	VVV ECMO (N=8)	p
Pre ECMO	pO2 (mmHg)	69.5 ± 25.2	72.4 ± 27.7	59.8 ± 10.2	0.058
	pCO2 (mmHg)	75.2 ± 63.3	64.8 ± 24.5	110.3 ± 124.1	0.336
	FiO2 (%)	0.95 ± 0.12	0.94 ± 0.14	1.0 ± 0.0	0.049
	PAP (cmH2O)	36.6 ± 7.9	36.4 ± 7.8	37.3 ± 8.7	0.784
	P/F ratio	79.3 ± 52.6	85.1 ± 58.6	59.8 ± 10.2	0.041
Immediate Post ECMO	pO2	105.5 ± 61.4	103.5 ± 61.3	112.3 ± 65.3	0.726
	pCO2	28.6 ± 6.8	29.2 ± 7.2	26.5 ± 5.5	0.334
	FiO2	0.62 ± 0.23	0.62 ± 0.23	0.63 ± 0.23	0.887
	PAP	26.8 ± 6.9	27.8 ± 6.1	23.3 ± 8.5	0.112
	P/F ratio	194.5 ± 135.3	196.6 ± 146.6	187.2 ± 95.2	0.832
4hrs after ECMO	pO2	105.0 ± 42.7	98.3 ± 31.6	127.6 ± 66.3	0.263
	pCO2	25.2 ± 3.5	25.5 ± 3.9	24.1 ± 1.4	0.137
	FiO2	0.53 ± 0.17	0.53 ± 0.17	0.51 ± 0.21	0.783
	PAP	27.2 ± 6.2	27.7 ± 5.6	25.3 ± 8.2	0.358
	P/F ratio	230.5 ± 147.8	205.9 ± 99.5	313.6 ± 243.3	0.258
24hrs after ECMO	pO2	99.8 ± 33.0	104.4 ± 35.1	84.4 ± 19.3	0.136
	pCO2	31.0 ± 5.7	31.1 ± 6.2	30.9 ± 4.1	0.932
	FiO2	0.48 ± 0.15	0.48 ± 0.15	0.49 ± 0.18	0.896
	PAP	26.3 ± 6.4	26.4 ± 5.7	26.0 ± 8.8	0.888
	P/F ratio	236.1 ± 133.4	246.4 ± 142.0	201.4 ± 99.5	0.410
48hrs after ECMO	pO2	103.6 ± 37.6	104.6 ± 38.8	100.3 ± 35.3	0.783
	pCO2	31.9 ± 6.1	32.1 ± 6.6	31.3 ± 4.41	0.759
	FiO2	0.5 ± 0.19	0.50 ± 0.17	0.47 ± 0.23	0.680
	PAP	27.2 ± 7.06	27.8 ± 7.0	25.1 ± 7.18	0.352
	P/F ratio	241.1 ± 132.5	236.6 ± 131.6	256.6 ± 143.5	0.713



·The triple cannulation group exhibited a significantly lower P/F ratio prior to VV ECMO initiation; however, this difference was no longer evident following ECMO insertion

Conclusion

- The general characteristics and comorbidities, excluding renal failure, showed no significant differences between the dual and triple cannulation ECMO groups.
- Although the triple cannulation group had a longer ECMO duration and started with more severe conditions, including significantly lower pre-ECMO P/F ratios, outcomes such as in-hospital mortality, successful weaning rates, post-ECMO BGA status and complications were comparable between the two groups.
- This suggests that the triple cannulation strategy may be as effective even in more severe cases.
- A larger group study is needed to validate these findings and explore any potential differences.