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Clinical benefits and safety of early tracheostomy for the patients requiring ECMO



- Patients who receive extracorporeal membrane oxygenation (ECMO) generally required prolonged mechanical ventilator support that related to several complications with poor outcome.
- Early tracheostomy can wean this patient from mechanical ventilator early and may improve clinical outcome by tapering sedative drugs, early enteral nutrition, and rehabilitation.
- This study investigates the benefits of early tracheostomy and best timing of early tracheostomy by measuring patient outcomes, including mortality, ventilator weaning success rate, ECMO weaning rate, tracheostomy site bleeding in patients who required ECMO.

- This retrospective observational study included 250 patients who underwent tracheostomy (percutaneous: 248, surgical 2) during ECMO in a tertiary hospital between 2015 and 2023. We analyzed their medical records, including tracheostomy-related complications and clinical variables.
- Early tracheostomy defined as that performed within 7 days after initiation of mechanical ventilator. Also, ventilator weaning defined as termination of ventilator support more than 10 days.

- Early group (n=180) receive tracheostomy at 3.8 days [2.2;4.8], while non early group(n=70) at 10.9 days [8.3;14.7]. There were no statistical differences between two groups including demographics, SAPSSII score, ECMO type.
- Early group showed shorter mechanical ventilator time (26.6 [15.9,42.2] vs 30.5 [21.6,52.9], p=0.008), and higher ventilator weaning rate (70/180(38.9%) vs 16/70(22.9%), p=0.025). Early tracheostomy can relate to higher ventilator weaning (OR 2.15, 1.14-4.05). However, other variables including survival rate, ECMO weaning rate, ECMO duration did not differ between two groups.
- There was no significant bleeding event occurrence between both groups with major and minor bleeding (40/180(22.2%) vs 10/70(14.3%), p=0.218). Additionally, using of heparin was similar (39/180(21.7%) vs 15/70(21.4%), p=1). And no other tracheostomy related complications such as pneumothorax, tracheal injury, and circuit clotting were happened.

Table1. Patients characteristic

Characteristics	non early T (n=70)	Early T (n=180)	p value
Tracheostomy days [IQR]	10.9 days [8.3;14.7]	8.8 days [2.2; 4.8]	0.541
Sex (%)	45 (64.3%)	138 (76.7%)	0.068
age [IQR]	64.5 [55.0;69.0]	59 [52.0;67.0]	0.07
Diabetes mellitus (%)	24 (34.3%)	45 (25.0%)	0.188
Hypertension (%)	32 (45.7%)	80 (44.4%)	0.968
Dyslipidemia (%)	16 (22.9%)	32 (17.8%)	0.461
Smoking (%)	10 (14.3%)	43 (23.9%)	0.135
Chronic kidney disease (%)	7 (10.0%)	25 (13.9%)	0.538
Peripheral arterial occlusive disease (%)	4 (5.7%)	12 (6.7%)	1
Old cerebrovascular accident (%)	0 (0.0%)	1 (0.6%)	1
Old myocardial infarction (%)	5 (7.1%)	12 (6.7%)	1
Percutaneous coronary intervention (%)	1 (1.4%)	9 (5.0%)	0.359
Stroke (%)	5 (7.1%)	10 (5.6%)	0.859
ECMO type			
ECMO VA (%)	36 (52.9%)	112 (62.9%)	0.338
ECMO VV (%)	31 (45.6%)	63 (35.4%)	
ECMO VAV (%)	1 (1.5%)	3 (1.7%)	
SOFA score [IQR]	12.0 [9.0;13.0]	11.0 [8.0;13.0]	0.35
SAPSII score [IQR]	66.0 [44.0;84.0]	58.0 [41.0;80.0]	0.19

Table2. Comparison of clinical outcomes in early tracheostomy

	non early T(n=70)	Early T(n=180)	p value
Ventilator weaning (%)	16 (22.9%)	70 (38.9%)	0.025
ECMO weaning (%)	23 (32.9%)	77 (42.8%)	0.196
Survival (%)	16 (22.9%)	63 (35.0%)	0.089
ECMO duration [IQR]	20.9 [13.3;30.9]	19.6 [12.6;33.9]	0.615
Mechanical ventilator time [IQR]	30.5 [21.6;52.9]	26.7 [15.9;42.2]	0.008
ICU stay [IQR]	36 [24.0;63.0]	35.5 [23.0;53.0]	0.683
Hospital day [IQR]	38.5 [26.5;69.0]	42 [27.4;63.0]	0.61

Table3. Tracheostomy site bleeding and heparin

	non early T (n=70)	Early T (n=180)	p value
Tracheostomy site bleeding (%)	10 (14.3%)	40 (22.2%)	0.218
Major bleeding (%)	2 (2.9%)	10 (5.6%)	0.571
Minor bleeding (%)	8 (11.4%)	30 (16.7%)	0.401
Heparin (%)	15 (21.4%)	39 (21.7%)	1

- Early tracheostomy that less than a week for ECMO patients can be performed safely and did not increase risk of bleeding.
- Early tracheostomy did not lead better survival, ECMO weaning rate, but helps ventilator weaning rate and shorten total mechanical ventilator time which may improve clinical outcomes.
- Further study is needed to clarify the impact of early tracheostomy for ECMO patients.