

The Hemodynamic Effects of Oxiris Haemofilter in Septic Shock Patients Requiring Renal Support: A Single Center Experience

Supplementary Material

Supplementary Table 1 Subgroup analysis of mortality rates of patients in different categories

Categories	ICU Mortality (%)	P value
Time from ICU admission to the start of oXiris treatment		0.58
< 24 hours (n=14)	11 (78.6)	
≥ 24 hours (n=21)	18 (85.7)	
Number(s) of filter use		0.37
1 (n=14)	13 (92.9)	
More than 1 (n=21)	16 (76.2)	
Frequency of filter change		0.69
24 hours (n=22)	17 (77.3)	
48 hours (n=6)	6 (100)	
72 hours (n=7)	6 (85.7)	
APACHE II score		0.01
<14 (n=2)	1 (50)	
15-24 (n=14)	9 (64.3)	
≥ 25 (n=19)	11 (100)	
Initial norepinephrine dosage (mcg/kg/min)		0.19
< 0.4 mcg/kg/min (n=19)	14 (73.7)	
≥ 0.4 mcg/kg/min (n=16)	15 (93.8)	
Source of infection		0.64
Abdominal/surgical (n=12)	11 (91.7)	
Others/medical (n=23)	18 (78.3)	
Culture		0.09
Gram-negative (n=26)	22 (84.6)	
Gram-positive (n=3)	3 (100)	

Fungus (n=3)	3 (100)	
No growth (n=3)	1 (33)	

Abbreviations: ICU, intensive care unit; APACHE II, acute physiology and chronic health evaluation II

Supplementary Table 2 Changes in metabolic and hemodynamic parameters in AKI patients with septic shock (n=31) and ESRD (n=4)

Parameters	Status	Baseline	48 hours	72 hours	P value ^a	P value ^b
MAP, mmHg	AKI	76 (67-80)	75 (72-92)	81 (72-99)	0.06	0.17
	ESRD	105 (85-114)	79 (77-101)	92 (86-110)	0.38	
Norepinephrine dosage, ucg/kg/min	AKI	0.42 (0.13-0.83)	0.36 (0.13-0.51)	0.18 (0.08-0.40)	0.02	0.12
	ESRD	0.27 (0.20-0.46)	0.19 (0.19-0.19)	0.22 (0.19-0.24)	<0.001	
Inotropic score*	AKI	43 (15-143)	36 (16-77)	20 (8-46)	0.01	0.30
	ESRD	43.5 (20-82.6)	19 (0-19)	19 (0-24)	0.007	
Vasopressor dependency index**	AKI	0.61 (0.21-1.91)	0.37 (0.23-1.07)	0.26 (0.10-0.60)	0.02	0.30
	ESRD	0.42 (0.18-1.04)	0.24 (0-0.25)	0.22 (0-0.25)	0.01	
SOFA	AKI	16 (13-17)	16 (13-17)	15 (14-17)	0.79	0.16
	ESRD	14 (10-18)	14 (6-15)	14 (6-14)	0.27	
Cardiovascular SOFA	AKI	4 (4-4)	4 (4-4)	4 (3-4)	0.04	0.19
	ESRD	4 (4-4)	4 (0-4)	4 (0-4)	0.22	
PaO ₂ /FiO ₂	AKI	184.7 (90-267.5)	189 (107.4-257.5)	189.4 (132.7-289)	0.92	0.40
	ESRD	240.3 (199.8-309.3)	328.7 (280-358.3)	274.7 (252.5-290)	0.02	
WBC, per mm ³	AKI	17,805 (5,760-27,320)	17,060 (10,650-26,930)	15,700 (9,680-26,210)	0.88	0.50
	ESRD	16,520 (12,875-37,750)	11,420 (10,650-12,400)	10,000 (9,500-13,790)	0.28	
Platelet, per mm ³	AKI	70,000 (24,000-194,000)	62,000 (32,000-100,000)	49,000 (24,000-81,000)	0.009	0.68
	ESRD	82,000 (41,500-173,000)	86,000 (23,000-180,000)	116,000 (54,000-160,000)	0.57	

Urine output, mL/d	AKI	100 (20-170)	97.5 (36-320)	62 (0-140)	0.61	0.27
	ESRD	0 (0-85)	0 (0-100)	0 (0-170)	0.47	
Lactate, mmol/L	AKI	8.3 (3.2-17.1)	4.5 (1.8-8.7)	2.6 (1.8-5)	<0.001	0.21
	ESRD	3.1 (1.7-10.9)	2.2 (1.8-2.6)	1.6 (0.6-2.4)	0.007	
Base excess	AKI	-7.8 (-13.5,-1.5)	-2.9 (-5.6,2.8)	-2 (-4.7,0.4)	0.005	0.98
	ESRD	-6.9 (-12.6,0.1)	0.3 (-7.8,4)	1.3 (-2.8,5.3)	<0.001	

Abbreviations: MAP, mean arterial pressure; SOFA, sequential organ failure assessment; WBC, white blood cells

^a Changes between each parameter over time in each subgroup, $p < 0.05$ is considered significant.

^b Comparison between changes in each parameter over time in AKI and ESRD group using generalized estimated equations, $p < 0.05$ is considered significant.

* Inotropic score was calculated by $100 \times \text{norepinephrine (}\mu\text{g/kg/min)} + [100 \times \text{epinephrine (}\mu\text{g/kg/min)}] + [\text{phenylephrine (}\mu\text{g/kg/min)}] + [\text{adrenaline (}\mu\text{g/kg/min)}]$ at baseline, 24, 48, and 72 hours after the start of CRRT.

** Vasopressor dependency index was calculated using inotropic score divided by mean arterial pressure also at baseline, 24, 48, and 72 hours.

Supplementary Table 3 Changes in metabolic and hemodynamic parameters compared between oXiris initiation within 24 hours (n=14) and after 24 hours (n=21)

Parameters	Timing	Baseline	48 hours	72 hours	P value ^a	P value ^b
MAP ^a , mmHg	<24 hrs	77 (71-80)	75 (72-92)	83 (72-102)	0.26	0.95
	≥24 hrs	76 (67-82)	77 (74-94)	83 (77-90)	0.25	
Norepinephrine dosage, ug/kg/min	<24 hrs	0.42 (0.1-1.13)	0.19 (0-0.46)	0.13 (0.08-0.25)	0.01	0.83
	≥24 hrs	0.34 (0.19-0.64)	0.36 (0.19-0.62)	0.21 (0.08-0.43)	0.08	
Inotropic score*	<24 hrs	89 (10-79.09)	16 (0-77)	15.2 (5-43)	0.005	0.64
	≥24 hrs	34 (21.75-71)	36 (19-62)	21 (8-43)	0.15	
Vasopressor dependency index**	<24 hrs	1.05 (0.13-2.64)	0.23 (0-1.07)	0.18 (0.07-0.58)	0.009	0.57
	≥24 hrs	0.44 (0.23-1.15)	0.37 (0.24-0.91)	0.24 (0.10-0.52)	0.29	
SOFA	<24 hrs	14 (12-18)	14 (11-17)	14.5 (11.5-15)	0.50	0.22
	≥24 hrs	16 (13-17)	16 (14-18)	15 (14-17)	0.77	
Cardiovascular SOFA	<24 hrs	4 (4-4)	4 (0-4)	4 (1.5-4)	0.09	0.16
	≥24 hrs	4 (4-4)	4 (4-4)	4 (3-4)	0.15	
PaO ₂ /FiO ₂	<24 hrs	180 (89.8-257)	186.5 (107.4-258)	217.4 (144.1-264)	0.62	0.24
	≥24 hrs	194.3 (150-391.3)	249.3 (119-280)	221.3 (132.7-290)	0.45	
WBC, per mm ³	<24 hrs	17710 (7540-27320)	13630 (10650-20310)	12235 (9760-17385)	0.40	0.51
	≥24 hrs	18470 (5630-36870)	15610 (10625-33685)	15870 (9500-28890)	0.82	
Platelet, per mm ³	<24 hrs	150,000 (59,000-220,000)	77,000 (38,000-102,000)	51,500 (37,000-78,000)	<0.001	0.40
	≥24 hrs	59,500 (22,500-109,500)	62,000 (23,000-100,000)	52,000 (23,000-105,000)	0.33	

Urine output, mL/d	<24 hrs	100 (28-315)	69.5 (36-258.5)	37.5 (10-116)	0.06	0.61
	≥24 hrs	57.5 (10-120)	90 (10-260)	70 (0-140)	0.66	
Lactate, mmol/L	<24 hrs	10.7 (6.4-18.1)	5.7 (3.7-13.9)	3.35 (1.85-5.4)	0.02	0.04
	≥24 hrs	3.85 (2.45-15)	2.4 (1.6-4.7)	2.05 (1.7-2.7)	0.002	
Base excess	<24 hrs	-13.5 (-19.9,-9.4)	-3.35 (-5.9,1.55)	-2.7 (-5.3,3.9)	<0.001	0.03
	≥24 hrs	-4.4 (-8.2,3.3)	-2.75 (-5.6,4)	-1.25 (-4.6,2.9)	0.24	

Abbreviations: MAP, mean arterial pressure; SOFA, sequential organ failure assessment; WBC, white blood cells

^a Changes between each parameter over time in each subgroup, $p < 0.05$ is considered significant.

^b Comparison between changes in each parameter over time in oXiris initiation time <24 and ≥ 24 hours group, $p < 0.05$ is considered significant.

* Inotropic score was calculated by $100 \times \text{norepinephrine (}\mu\text{g/kg/min)} + [100 \times \text{epinephrine (}\mu\text{g/kg/min)}] + [\text{phenylephrine (}\mu\text{g/kg/min)}] + [\text{adrenaline (}\mu\text{g/kg/min)}]$ at baseline, 24, 48, and 72 hours after the start of CRRT.

** Vasopressor dependency index was calculated using inotropic score divided by mean arterial pressure also at baseline, 24, 48, and 72 hours.

Supplementary Table 4 Review of literature comparing published case series using oXiris membrane

Data	Shum ²²	Turani ²⁶	Schwinddenhammer ²⁵	Zhang ²⁷	Our study
Country	Hong Kong	Italy	France	China	Thailand
Numbers of patients	6 (Control 24)	60	31	4	35
Time to initiation, hrs	20.7	N/A	25	N/A	46
Anticoagulant (n)	Citrate	Citrate (40) Heparin (20)	Citrate (17) Heparin (13) None (12)	None (3) Citrate (1)	None (33) Citrate (2)
Filter lifetime, hrs	61 [35,72]	74 ± 36	17 [5,54]	12-36	23 [14,36]
Clinical parameters	↓ SOFA* ↑ NorE	↓ SOFA* ↓ NorE* ↑ MAP* ↑ Diuresis* ↑ PaO ₂ /FiO ₂ *	↔ SOFA ↓ NorE* ↔ PaO ₂ /FiO ₂ ↔ Diuresis	↓ SOFA ↓ NorE ↑ Diuresis	↔ SOFA ↓ cSOFA* ↓ NorE* ↑ MAP ↔ PaO ₂ /FiO ₂ ↔ Diuresis
Laboratory parameters	N/A	↓ Lactate* ↓ IL-6* ↓ IL-10* ↓ PCT* ↓ EAA*	↓ Lactate*	↓ PCT	↓ Lactate* ↑ BE*
ICU Mortality	33%	N/A	N/A	50%	82.9%
Hospital Mortality	50%	N/A	64.5%	50%	91.4%

Abbreviations: SOFA, sequential organ failure assessment; NorE, norepinephrine; MAP, mean arterial pressure; IL, interleukin; PCT; procalcitonin; EAA, endotoxin activity assay; BE, base excess

* represents statistically significant parameters