

The first succesful extracorporeal membranous oxygenation treatment in a child with refractory fulminant myocarditis in Turkey

To the Editor,

In acute fulminant myocarditis (AFM) with refractory medical treatment, the ventricular function returned to normal if venous–arterial ECMO (VA-ECMO) is applied early (1, 2).

A previously healthy 26-month-old girl was brought to the hospital with a 3-day history of vomiting, fever, and tachypnea. Her Glasgow coma scale was 11, respiratory rate was 60/min, heart rate was 152/min, blood pressure was 76/50 mm Hg, capillary refill time was 5 s, body temperature was 36°C, and SpO₂ was 85%. She had gallop rhythm and sinus tachycardia. Echocardiographic fractional shortening (FS) was 8%. Her serum creatinine level was 0.9 mg/dL, AST level was 377 U/L, ALT level was 71 U/L, lactate level was 2.4 mmol/L, and troponin-I level was >50 ng/mL. Her arterial blood gas analysis reveled metabolic acidosis and hypoxemia. Other laboratory test results were normal. She was intubated and maintained on mechanical ventilation (MV) in the pediatric intensive care unit (PICU). Dopamine, dobutamine, human γ -globulin, vancomycin, and ceftriaxone were started. Pulsatile ventricular tachycardia (VT) occurred shortly after admission. Adenosine,

lidocaine, amiodarone, and magnesium sulfate were given. Despite numerous cardioversion attempts, she did not respond. Dopamine, dobutamine, adrenalin, and noradrenalin were given in high doses due to refractory cardiogenic shock. Milrinone, terlipressin, and NaHCO₃ were administered. We took a decision of performing VA-ECMO because of refractory VT and cardiogenic shock. She was cannulated in the right internal jugular vein with a 14 Fr catheter by the Seldinger method. The left femoral artery was a 10 Fr catheter fitted in an open surgical procedure at bedside. The perfusion of the left leg was provided by a 20 G branul between the ECMO arterial line and distal femoral artery. Six hours after admission, ECMO was established with kits (Maquet, Rastatt, Germany). At the 30th hour of VA-ECMO, she returned to sinus rhythm by cardioversion. On the day 3 of VA-ECMO, renal failure and fluid overload appeared. We applied continuous hemodiafiltration (CHDF) connected to the ECMO system. On day 4, FS was measured to be 25%, and ECMO was terminated. The 14 Fr right internal jugular vein catheter was changed to an 8 Fr hemodialysis catheter. No complication was observed except for mild bleeding from the edge of the ECMO cannula. CHDF treatment was continued for 4 days. MV was stopped on day 10 (Table 1). There were no abnormal findings on viral serology and bacterial cultures. Myocardial perfusion scintigraphy revealed hypoperfusion, dyskinesia in the anterior wall, and decreased left ventricular wall motion on the 27th day. She was discharged on day 30. After 1 month, her neurological examination, echocardiography, cranial MRI, and EEG were normal. She is completely healthy after 1 year of follow-up.

Table 1. Patient follow-up

Day	Before ECMO	ECMO 1	ECMO 2	ECMO 3	ECMO 4	Post ECMO 6	Post ECMO 15
ECMO blood flow, cc/kg/min		85–100	80–100	60–80	25 ECMO stop		
Heart rate/min	160–180	120–180	120–150	100–130	80–90	90–100	100–110
Urine output, cc/kg/h	1	1	0.8	0.6	0.4	1	2
ECO FS%	8	8	8	20	25	28	28
Lactate, mmol/L	6.6	5.6	1.6	1.3	1	0.5	0.5
SaO ₂ %	63	65	97	98	99	100	100
Troponin I, ng/mL	>50 ng/mL	>50 ng/mL	>50 ng/mL	45.8	12.3	1.5	0.17
Hb, g/dL	10.7	9.6	9	8.5	9	9.4	8
Plt/mm ³	260000	98000	103000	110000	110000	178000	479000
INR	1.3	2	1.5	1.5	1.4	1.2	1
Urea, mg/dL	69	72	109	60	40	38	34
Creatinine, mg/dL	1.7	1.9	2.3	1.2	0.9	0.9	0.8
AST, U/L	981	1200	7730	4840	2300	200	55
ALT, U/L	395	560	2486	1951	1509	183	35
Dopamine, mcg/kg/min	15	15	15	-			
Dobutamine, mcg/kg/min	15	10	10	-	5		
Adrenalin, mcg/kg/min	3	1	0.3	-			
Noradrenalin, mcg/kg/min	3	1	0.2	-			
Amiodoron, mcg/kg/min	10	10	30. hour stop	-			
CHDF				+	+	Terminated	

ALT - alanine aminotransferase; AST - aspartate aminotransferase; CHDF - continuous hemodiafiltration; ECO - echocardiography; ECMO - extracorporeal membrane oxygenation; FS - fractional shortening; Hb - hemoglobin; INR - international normalized ratio; Plt - platelets; SaO₂% - arterial oxygen saturation.

The use of VA-ECMO has been increasing in congenital heart surgery centers for children in Turkey (3). Only one child with myocarditis (not fulminant) was reported from the largest multicenter study in Turkey (20 patients from 6 PICUs). Unfortunately, this patient died after 13 days of ECMO support (4). Our patient is the first child with AFM who was discharged healthy after VA-ECMO in Turkey. The application of ECMO at an appropriate time is considered to be an effective and safe treatment for assisting circulation in conservative treatment-resistant AFM. CHDF connected to the ECMO circuit can be successfully applied during ECMO support.

Acknowledgement: We thank Dr. Gülberat İnce and Dr. Kadir Burhan Karadem for their contributions.

Ayşe Berna Anıl, Fulya Kamit Can¹, Soysal Turhan², Neslihan Zengin¹, Murat Anıl³, Ali Rahmi Bakiler⁴, Buket Doğrusöz⁴
Pediatric Intensive Care Unit, Faculty of Medicine, İzmir Katip Celebi University; İzmir-Turkey
Departments of ¹Pediatric Intensive Care Unit, ²Cardiovascular Surgery, ³Pediatric Emergency, ⁴Pediatric Cardiology, İzmir Tepecik Research and Training Hospital; İzmir-Turkey

References

1. Teele SA, Allan CK, Laussen PC, Newburger JW, Gauvreau K, Thiagarajan RR. Management and outcomes in pediatric patients presenting with acute fulminant myocarditis. *J Pediatr* 2011; 158: 638-43. [\[CrossRef\]](#)
2. Ning B, Zhang C, Lin R, Tan L, Chen Z, Yu J, et al. Local experience with extracorporeal membrane oxygenation in children with acute fulminant myocarditis. *PLoS One* 2013; 8: 1-5. [\[CrossRef\]](#)
3. Öztürk MN, Ak K, Erkek N, Yeşil E, Duyu M, Yazıcı P, et al. Early extracorporeal life support experiences in 2 tertiary pediatric intensive care units in Turkey. *Turk J Med sci* 2014; 44: 769-74. [\[CrossRef\]](#)
4. Onan IS, Haydın S, Ündar A, Yalundağ-Öztürk MN, Demirkol D, Kalkan G. A multidisciplinary approach to expand the use of pediatric ECLS systems in Turkey. *Artif Organs* 2015; 39: 7-13. [\[CrossRef\]](#)

Address for Correspondence: Dr. Ayşe Berna Anıl
Onur Mah. Dalya Sok. Onur Apt. No: 66/10
Balçova/İzmir-Türkiye
Phone: +90 505 578 07 65
E-mail: aysebernaanil@hotmail.com

©Copyright 2015 by Turkish Society of Cardiology - Available online at www.anatoljcardiol.com
DOI:10.5152/AnatolJCardiol.2015.6681

