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Case Report Open Access

Extracorporeal Membrane Oxygenation for Adult Respiratory Distress Syndrome after Near-drowning

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Abstract

Background: Near-drowning victims surviving the initial period of asphyxia may develop life-threatening adult respiratory distress syndrome (ARDS). We highlight current understanding of extracorporeal membrane oxygenation (ECMO) for successful clinical management of severe ARDS in adult near-drowning victims with reference to a recent case of accidental submersion.

Patient: Previously healthy 18-year-old female near-drowning victim with progressive hypoxaemia, hypercapnaemia, acidaemia and multiple organ failure.

Results: Rapid restitution of respiratory function during a three-day period of treatment with venovenous ECMO.

Conclusion: Extracorporeal membrane oxygenation is a feasible option in near-drowning adult victims with progressive ARDS not responding appropriately to conventional protective ventilation.

Keywords: Case reports; Extracorporeal membrane oxygenation; Near drowning; Respiratory distress syndrome; Adult

Introduction

A near-drowning victim surviving the initial period of prolonged asphyxia may develop life-threatening Adult Respiratory Distress Syndrome (ARDS). Some centres recommend Extracorporeal Membrane Oxygenation (ECMO) in selected near-drowning paediatric patients [1-5], whereas few adult cases have been reported [6].

We highlight current understanding of this option of treatment in adult near-drowning victims with reference to a recent case, where ECMO was successfully used to treat an adult female near-drowning victim with severe ARDS. Informed written consent was obtained from the patient, and the clinical report was approved by the Ethics Review Board at Lund University Faculty of Medicine, Lund, Sweden.

Patient

A previously healthy 18 year-old female was rescued from a sunken car in a city canal in Malmö in southern Sweden in the end of May. She had carotid pulsations, apnoea and dilated pupils, and was endotracheally intubated at the site of the accident.

In the emergency room the patient was hypothermic (33.1°C) and acidotic (pH 7.1) with bilateral pulmonary rales. She was initially extubated and transferred to the intensive care unit.

During the first hour after arrival in the intensive care unit, the patient developed pulmonary oedema and was reintubated. Within the next 48 hours she deteriorated with pneumomediastinum, pneumoperitoneum, hypoxaemia, hypercapnaemia, and ARDS, as part of multiple organ failure including leucopenia, progressive coagulopathy, and systemic hypotension (systolic arterial pressure 30-40 mmHg). She was transferred to the national ECMO centre in Stockholm within the next twelve hours. Arterial blood gas levels immediately preceding ECMO treatment were PO2 5.5, PCO2 12.2, and pH 7.2, at an inspired **oxygen** fraction of 1.0, with positive end expiratory and peak pressure levels of 16 and 36 cm H2O, respectively. The patient gradually stabilized during the 73-hour period of venovenous ECMO treatment, was referred back to her hospital and recovered with no major neurological deficit.

Discussion

In drowning or near-drowning, an initial episode of laryngospasm is often followed by aspiration of water [7]. The volume of water aspirated is often not enough to induce classical signs of hyper- or hypovolaemia (depending on the tonicity of the water), as reported in early experimental studies [8, 9]. Nevertheless, prolonged submersion may lead to inactivation of surfactant [**10**], alveolar damage, ventilation-perfusion mismatch [11], reduced pulmonary compliance [12], and (as reported here) ARDS.

Extracorporeal membrane oxygenation enables protective ventilation in patients with severe ARDS, otherwise requiring ventilator settings detrimental to pulmonary tissue and to vital organ perfusion [13].

There are few publications on ECMO treatment for pulmonary injury in adult near-drowning victims [6]. The British conventional ventilation or ECMO for severe adult respiratory failure (CESAR) multicenter trial, has reported non-significantly (P=0.07) higher

survival in the ECMO group (odds ratio 0.73; 95 % confidence interval 0.52–1.03) [14].

Early clinical recognition of respiratory failure indicating rapid need for ECMO is crucial, since it may take several hours to reach the patient from an ECMO centre. More than one patient in twenty (5.5 %) in the ECMO arm of the CESAR study died before ECMO could be initiated [14].

Venovenous ECMO is a feasible therapeutic option worth considering in near-drowning adult victims with severe or rapidly progressive ARDS not responding appropriately to conventional protective ventilation.

Conflict of Interest

No conflict of interest is reported, and no financial or technical support is acknowledged.

References

1. Steiner RB, Adolph VR, Heaton JF, Bonis SL, Falterman KW, et al. (1991) Pediatric extracorporeal membrane oxygenation in posttraumatic respiratory failure. J Pediatr Surg 26: 1011-1014.
2. Weber TR, Tracy TF Jr, Connors R, Kountzman B, Pennington DG (1992) Prolonged extracorporeal support for nonneonatal respiratory failure. J Pediatr Surg 27: 1100-1104.
3. Weber TR, Kountzman B (1998) Extracorporeal membrane oxygenation for nonneonatal pulmonary and multiple-organ failure. J Pediatr Surg 33: 1605-1609.
4. Thalmann M, Trampitsch E, Haberfellner N, Eisendle E, Kraschl R, et al. (2001) Resuscitation in near drowning with extracorporeal membrane oxygenation. Ann Thorac Surg 72: 607-608.
5. Eich C, Brauer A, Kettler D (2005) Recovery of a hypothermic drowned child after resuscitation with cardiopulmonary bypass followed by prolonged extracorporeal membrane oxygenation. Resuscitation 67: 145-148.
6. Peralta R, Ryan DP, Iribrane A, Fitzsimons MG (2005) Extracorporeal membrane oxygenation and CO2 removal in an adult after near drowning. J Extra Corpor Technol 37: 71-74.
7. Lunetta P, Modell JH, Sajantila A (2004) What is the incidence and significance of "dry-lungs" in bodies found in water? Am J Forensic Med Pathol 25: 291-301.
8. Fuller RH (1963) The 1962 Wellcome Prize Essay. Drowning and the postimmersion syndrome. a clinicopathologic study. Mil Med 128: 22-36.
9. Orlowski JP, Abulleil MM, Phillips JM (1987) Effects of tonicities of saline solutions on pulmonary injury in drowning. Crit Care Med 15: 126-130.
10. Gonzalez-Rothi RJ (1987) Near drowning: consensus and controversies in pulmonary and cerebral resuscitation. Heart Lung 16: 474-482.
11. Ibsen LM, Koch T (2002) Submersion and asphyxial injury. Crit Care Med 30: S402-408.
12. Colebatch HJ, Halmagyi DF (1961) Lung Mechanics and resuscitation after fluid aspiration. J Appl Physiol 16: 684-696.
13. Lewandowski K (2000) Extracorporeal membrane oxygenation for severe acute respiratory failure. Crit Care 4: 156-168.
14. Peek GJ, Mugford M, Tiruvoipati R, Wilson A, Allen E, et al. (2009) Efficacy and economic assessment of conventional ventilatory support versus extracorporeal membrane oxygenation for severe adult respiratory failure (CESAR): A multicentre randomised controlled trial. Lancet 374: 1351-1363.