Successful Adult ECMO in a Patient Suffering a Traumatic Brain Injury and Severe ARDS

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I have no disclosures to state
Overview

• Case report of adult ECMO
• Pedestrian vs vehicle accident
• Serious polytrauma
• Life threatening injuries
• Multi-disciplinary team approach

• Admitted 11 October 2014
Patient Demographic Data

- Female patient
- 20 years of age
- No other disease: fit and healthy young person
- 70Kg
- 155cm
- BSA 1.69m²
Clinical Background

- Principle diagnosis:
  - Severe head injury
  - Diffuse axonal injury (DAI)
  - Multiple hemorrhagic contusions:
    - Frontotempoparietal with cerebral edema
  - Fracture of mandible, left transverse processes of L3, L4, L5
  - Fracture of S1 vertebra
  - Fracture of pelvis, tibia and fibula
  - Blunt chest injury - hemothorax, spleen injury
Diffuse Axonal Injury

- Most severe form of traumatic brain injury (TBI)
- 90% never regain consciousness:
  - *leading cause of TBI associated death*
- Results from acceleration/deceleration injuries
  - Shearing of tissue occurs, resulting in massive edema
First Few Days

- Patient stabilized, sedated, paralyzed and investigations commenced. Repeat CTs every couple of days:
  - severe edema with hemorrhagic contusions
- ICP monitored
- Evidence of increasing ICP and cerebral edema
- Ortho consult: awaiting clearance from neuro
- Satisfactory ABG on ventilator
- Developed central line associated blood stream infection (CLABSI):
  - *Acinetobacter baumannii*, on Tazocin
Patient still critical; repeat CT demonstrated diffuse brain edema with hemorrhagic contusions

ICP increasing: failed to respond to neuroprotective strategies and mannitol

Chest X-Ray: bilateral basal haziness with ARDS like picture

Sputum growing *Pseudomonas aeruginosa* and *streptococcus*.

- Spiked high grade fever
- Worsening hypotension
- Progressive lung infiltrates indicating severe ARDS
  - Murray Score=4 (ARDS>2.5)
Respiratory Failure

- Failed inhaled nitric oxide and high frequency oscillator
  - PC 25, PEEP 22, FiO₂ 100%
- Despite unprotected ventilation strategy:
- PaCO₂ 100mmHg, pH 7.0
- On day 14 ECMO initiated
- Uncertain neurological prognosis: diffuse axonal injury plus risk of intracranial hemorrhage
- Young patient age, fit and healthy was drive for ECMO
Initiation of ECMO

- VV ECMO initiated with:
  - Access: 25 Fr venous in left femoral
  - Return: 20Fr Arterial in right jugular
- PLS system used, with Maquet Quadrox oxygenator
  - Bioline (Heparin) coating tip-to-tip
- Zero heparin used: neuro risk

- Converted to Cardiohelp on ECMO day 2.
  - Bioline coating

Total run 11 days, 6 hours
ECMO Run Data

- Pump flow minimum: CI of 2.2-3.72 LPM
- ACT monitored q6: lowest reported 146, average around 180
  - Fibrin and small clots noted at day 2
- Platelet: lowest 42k, average 80-100k
- RBCs transfused at HCT 22%, average approx. 28%.
- 2 trips to CT: initial showed severe edema with hemorrhagic contusions, second showed improvement of brain and lungs
- Lung X-Rays continued to improve
- Low flow and trial off successful
  - Converted to ventilation
Post ECMO

• All orthopedic injuries treated successfully
• Sedation weaned
• PT and rehab started

• Discharged 5 February 2015
• Continuing PT and rehab
Team work

- Given nature of injuries multi-disciplinary team work resulted in a successful outcome
- Involved:
  - Neurosurgery
  - Ortho/Trauma surgery
  - Intensivists
  - CT surgery
  - Perfusion
  - PT/rehab services
  - Allied health
Just Another Spring Day in Doha: 113°F