PREVENTING AND TREATING INFECTION FOR ECMO PATIENTS

Daniel J. Anderson, MD
Infectious Disease ANGMA
Hospital Epidemiology, Abbott Northwestern Hospital
May 6, 2019

DISCLOSURES

- No relationship with industry
- No conflicts of interest
- I may discuss off label use of antibiotics

OBJECTIVES

- Background
- Epidemiology of ECMO infections (ECMOIs)
- Diagnosis of ECMOIs
- Management of ECMOIs
- Prevention of ECMOIs
- The future …

BACKGROUND - Considerations

- ECMO varied uses / indications (variable risk of infection)
  - VV, VA and combination
  - Indications ⇔ Pulm, CV, ECPR
  - Bridge to other advanced interventions
    - LVAD
    - Orthotopic Heart Transplant
- Patient population ⇔ infection risk
  - Comorbidities
  - Hospital exposure
  - Antibiotic Exposure

BACKGROUND

- Definitions of infections – important in analyzing studies
  - Uninfected, uncolonized
  - Device colonization
  - Device infection
  - Infection while on - but not involving - ECMO
- Consequences
  - Mortality
  - Loss of transplant candidacy
  - Increased risk other complications / complexity of care

EPIDEMIOLOGY

- Prevalence ⇔ 10-30 % (20-30 infections/1000 pt-d)
- Risks for ECMOIs
  - Patient characteristics (age, infection at time ECMO initiation, preexisting autoimmune disorder, preexisting infection)
  - Configuration (VA higher risk than VV in most studies)
  - Duration ECMO (> 2 w twice the risk of < 1 w)
- ECMO-related infection increases mortality by 35 to 60 %

EPIDEMIOLOGY

- Pathogens
  - Gram + cocci (Staph / Enterococcus / Strep)
    - Coagulase negative Staph 15.9 %
  - Candida spp 12.7 %
  - Gram – bacilli
    - *P aeruginosa* 10.5 %
- Infections
  - Blood stream infection (BSI) ⇔ most common
  - Pneumonia
  - *Clostridioides difficile* (formerly *Clostridium difficile*)
  - Mediastinitis / Pleural empyema / UTI / others

DIAGNOSIS

Lack some typical infection indicators
  Temp / WBC / Biomarkers may not be reliable
  CXR not good positive predictive value (PPV)
Monitor for clear change from baseline
  T, WBC, vent settings, other support needs
CT scan more informative than plain radiography

MANAGEMENT

- Avoid sampling blood from circuit
- No data to support routine ATBs w/o evidence inf'n
- Judgment call if ATBs for transthoracic cannulation with open chest wound
- Pharmacy help (drug interactions / pharmacodynamics)
- Know local antibiotic susceptibility patterns
- http://ww5.allinahealth.org/ahs/allinalabs.nsf/page/MicroSusc_ANW.pdf/$FILE/MicroSusc_ANW.pdf (for ANW 2017 data)
- Circuit change usually not needed – last resort

PREVENTION – Antibiotic Prophylaxis

- At cannula insertion ⇔ routine antibiotic just before procedure
- Judgment call if ATBs for transthoracic cannulation / open chest
- No data for routine use of antibiotics during ECMO support
  - C diff risk
  - Selection of multi drug resistant organisms
  - Yeast overgrowth
- Antifungal prophylaxis – consider if
  - Prolonged open chest while on multi-drug antibacterial therapy
  - Significantly immune compromised

PREVENTION – Non antibiotic measures

- Avoid obtaining blood samples from circuit
  - Use peripheral iv access for intermittent infusions / blood sampling
- Remove all other non-essential vascular access devices
- Normal ventilator associated pneumonia (VAP) prevention
- Early enteral nutrition
- Wean of ECMO as soon as possible

FUTURE DIRECTIONS

- Changes in cannula design, circuit configurations
- Defining better means to more precisely diagnose infections
- Changing microbiology
- Role of new antimicrobial agents

REFERENCES

- ELSO ID TASK FORCE Recommendation Summary & Infection Control and Extracorporeal Life Support [accessed 4/14/19] https://www.elso.org/AboutUs/TaskForces/InfectiousDiseaseTaskForce.aspx
- Extracorporeal Life Support Organization (ELSO) General Guidelines for all ECLS Cases August, 2017
- Predictors of Infections and Mortality in Adult Patients Undergoing Extracorporeal Membrane Oxygenation (ECMO). Viotti J, Cloke C, Shaikhomer M, et al.2017 (Abstract 2163. IDWeek, San Diego, CA)
- Venovenous extracorporeal membrane oxygenation devices-related colonisations and infections. Thomas G, Hraiech S, Cassir N, et al. Ann Intensive Care 2017;7:111

Allina Health

REFERENCES

- Diagnosis of infection in patients undergoing extracorporeal membrane oxygenation: A case-control study Pieri M, Greco T, De Bonis M, et al. J Thorac Cardiovasc Surg 2012;143:1411-6.
- Extracorporeal Membrane Oxygenation (ECMO) for Long-Term Support: Recent Advances Conway R, Tran D, Griffith B and Wu Z. Advances in Extra-corporeal Perfusion Therapies. Advances in Extra-corporeal Perfusion Therapies Edited by Michael S. Firstenberg 2018; Chapter 14:213-28.
- Complications of extracorporeal membrane oxygenation for treatment of cardiogenic shock and cardiac arrest: A meta- analysis of 1,866 adult patients. Cheng R, Hachamovitch R, Kittleson M, et al. The Annals of Thoracic Surgery. 2014;97(2):610.

Allina Health

REFERENCES

- Infections occurring during extracorporeal membrane oxygenation use in adult patients. Sun H Y, Ko W J, Tsai P R, et al. J Thorac Surg and Cardiovasc Surg. 2010;140(1):1125-32.
- Infections during extracorporeal membrane oxygenation: epidemiology, risk factors, pathogenesis and prevention. Biffi S, De Bella S, Scaravilli V, et al. Int J Anticrob Agents 2017;50:9-16.
- Epidemiology of infectious complications during extracorporeal membrane oxygenation in children. A single-center experience in 46 runs. Castagnola E, Gargiullo L, Loy A, et al. Pediatr Infect Dis 2018;37:624-6.

Allina Health

TO CONTACT ME

Daniel J. Anderson, MD
Infectious Disease – ANGMA

(office) 612-863-4096
(fax) 612-863-2132
(email) Daniel.anderson@allina.com

Allina Health