Case Series

Out of body: Next generation life support

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Abstract

Background: A male patient with ankylosing spondylitis on tofacitinib presented with severe bacterial pneumonia that rapidly progressed to refractory acute respiratory distress syndrome (ARDS)

Key words: Acute respiratory distress syndrome (ARDS); High-Flow Nasal Oxygen (HFNO)

1. Case 1

1.1. Clinical Presentation

A 35-year-old male with Ankylosing Spondylitis, managed long-term with the JAK inhibitor Tofacitinib, presented with a five-day history of fever and cough. He was diagnosed with severe bacterial pneumonia that quickly evolved into ARDS.

1.2. Initial Management & Deterioration

- First-line Therapy: High-Flow Nasal Oxygen (HFNO) and self-awake proning.
- Clinical Course: Rapid respiratory exhaustion and worsening infiltrates.
- Escalation: Endotracheal intubation and mechanical ventilation.
- Failure of Conventional Rescue: Refractory hypoxemia despite optimized PEEP and prone positioning.
- He was initiated on hemoperfusion using HA 380 filter to mitigate biotrauma

1.3. Initiation of Extracorporeal Support

- Indication: Refractory hypoxemia and declining systemic hemodynamics.
- Intervention: VA-ECMO initiated within 6 hours of failed prone ventilation.
- Rationale: Simultaneous support for pulmonary gas exchange and hemodynamic stabilization.

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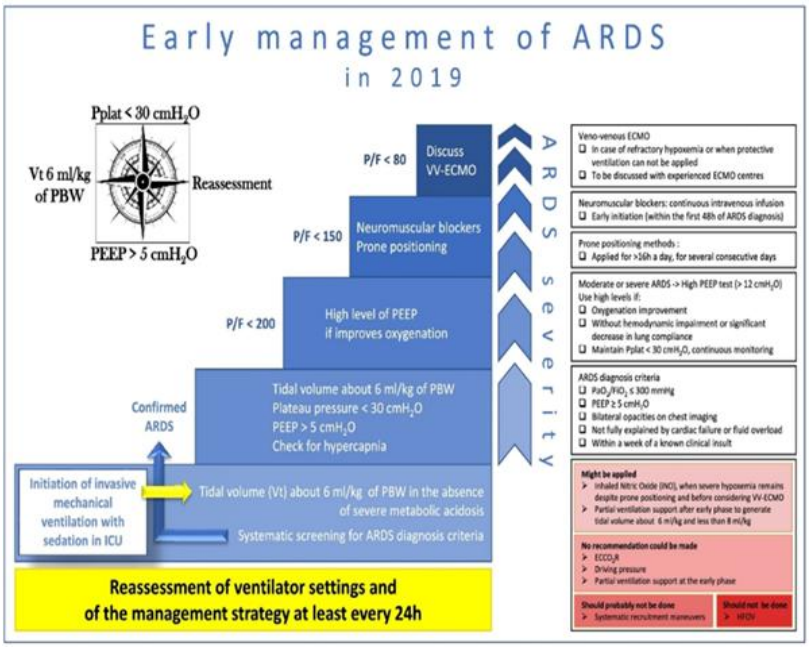

Image Source: Laurent Papazian et al. Springer Nature Link. 2019;9(6)

1.4. The Physiological Conflict: North-South Syndrome

- Clinical Finding: Evidence of differential hypoxia (Harlequin Syndrome).
- Mechanism: Competitive flow between the native cardiac output (deoxygenated) and ECMO return (oxygenated), leading to upper body desaturation.
- Need for Adaptation: Transition from VA to a hybrid configuration.

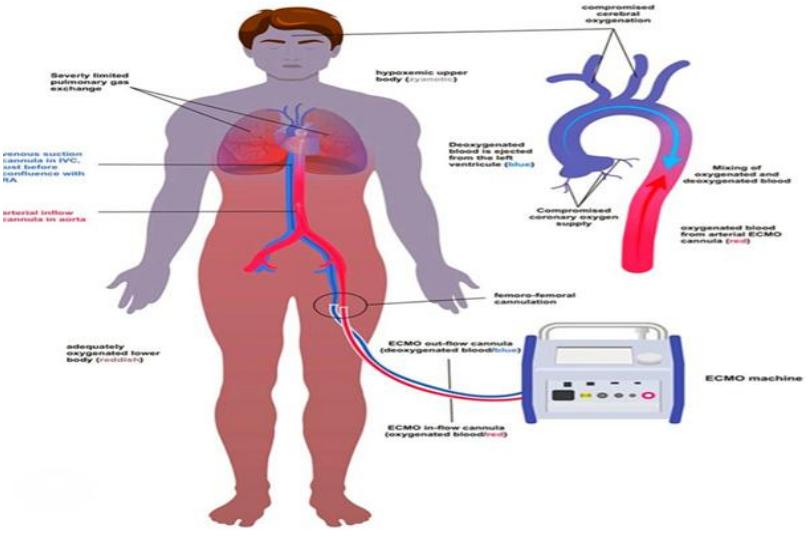

Image Source: Simon A. Amacher. Frontiers et al. Frontiers in Cardiovascular Medicine. 2021

- Following VAV transition target pao2 and systemic organ perfusion were successfully maintained.
- Bronchoscopy done – clot present in right lower lobe – profuse bleed. Et tube changed.

- Clinical stability was evidenced by normalized lactates, adequate urine output, preserved neurological status.
- Patient was successfully stabilized and transferred via ground ambulance to Heart Lung transplant unit, Kauvery hospital vadapalani for further management
- Brochoalveolar lavage pneumonia panel – influenza b, *klebshiella pneumonia*, *staphylococcus aureus*. Antibiotics are modified as organisms.
- Patients gradually weaned from VAV to VV ECMO.
- Patients' lung mechanics gradually improved. VV ECMO sweep gas and fio2 gradually reduced and successfully decannulated.
- Right now, tracheostomised on bipap support

1.5. Goals on VV ECMO

- To replace pulmonary function (oxygenation and decarboxylation)
- To allow lungs to rest
- To allow healing of the lungs
- VV ECMO and native circulation
- Physiologically neutral
- No effects on hemodynamic parameters

VA ECMO

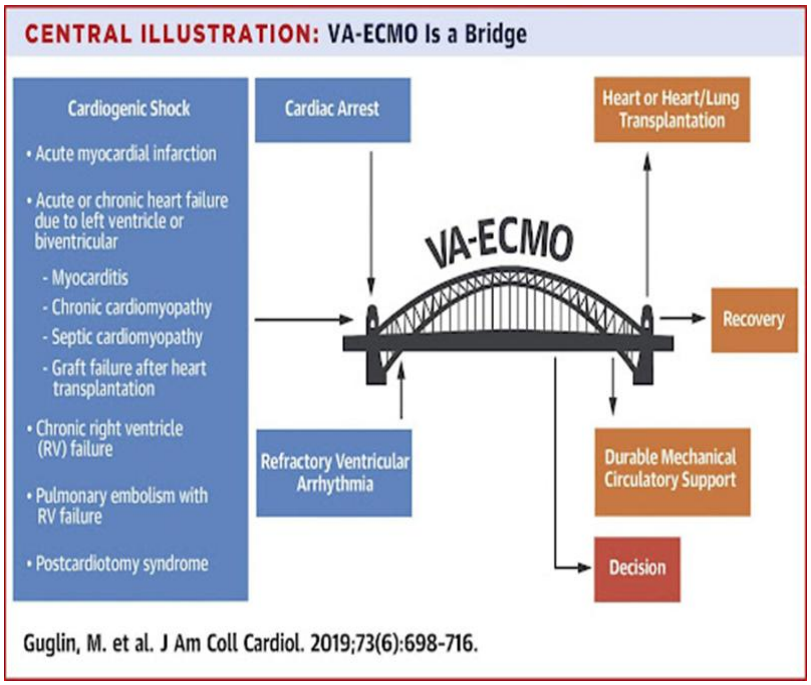

Image Source: : Maya Guglin et al. JACC Journals.2019;73(6)

2. Case 2

A 59-year male with a comorbidity of type 2 DM, S HTN since 12 years.

2.1. Presenting complaints

- Breathlessness Grade 4 MMRC for 2 days
- Decreased urine output for 2 days.
- Fever for 2 days.
- Cough with expectoration 4 days
- He was initially taken to NLC hospital and referred here for further management.
- Brought to ER on 21/12/25 AT 4 AM.

2.2. Examination

Lean built, drowsy, not responding to painful stimuli, tachypneic (RR – 50)

Auscultation - CVS-S1S2+, RS- B/L basal crackles+, P/A- soft, distended.

2.3. Vitals

BP - 60mmHg

PR - 140/min, NSR

SPO2 - 70 % with NRBM 15LO2

2.4. Pocus in ER

- Adequate LV function, LVH+
- IVC- 0.8cm > 50 % collapsible
- Lungs- Bilateral B profile [anterior to posterior]
- Abdomen- no significant findings
- DVT screening- B/L femoral, popliteal- Negative

2.5. Management in ER

- ABG PH- 6.84 pco2-12 po2- 40 lac 14 hco3- 6 (severe metabolic acidosis)
- Intubated put on PRVC mode (TV- 360 ml , fio2-100 %, RR-26/mt, PEEP- 8)
- Refractory shock - fluid bolus approximately 30 ml/kg given. Simultaneously started on vasopressors infusion. Worsening shock requiring triple vasopressors- Noradrenaline, Vasopressin, Adrenaline

3. Working diagnosis

- Septic shock (source- lung)
- Severe ARDS

4.1. Sepsis definition

- Sepsis – dysregulated immune response to infection resulting in organ dysfunction.
- Septic shock - Hypotension not responding to fluids . Need for vasopressors to maintain map of 65 mmhg or more and a lactate > 2mmol/l

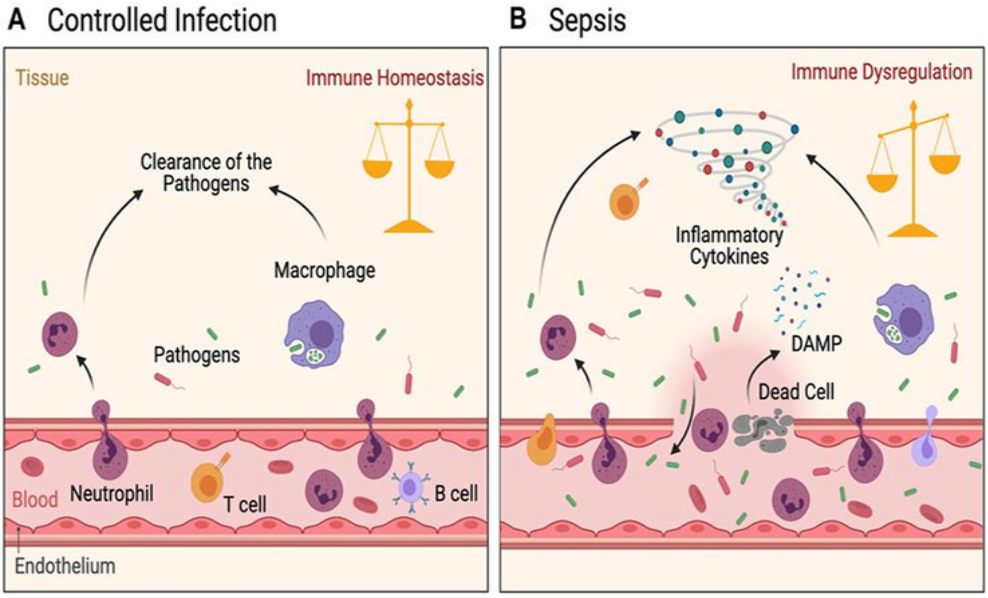

Image Source: Jian Chen et al. Frontiers. 2021;(12)

4.2. Sepsis

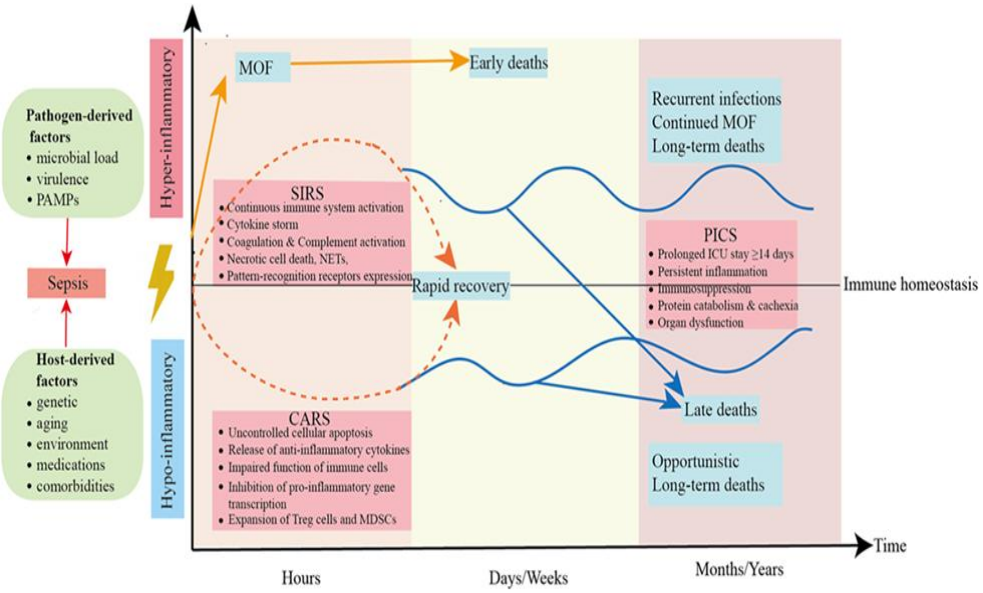

Image Source: Min Cao et al. Cell Death Discovery. 2023

5. Management

- IV antibiotics (cefoperazone+sulbactum, azithromycin, oseltamivir
- Stress dose steroids
- Triple vasopressors support
- Shifted to ICU.
- Patient continued to be anuric
- Refractory shock
- Severe ARDS
- Too sick to be transported from ER to ICU (spo2 78 % on 100 % fio2). Post recruitment with a peep of 35 cmh20 spo2 increased to 95%.
- High risk consent for transport obtained.
- Shifted to ICU

6. ICU management

6.1. Day 1

Investigations

- Tc 34,000
- Procalcitonin > 100
- Prone ventilation initiated. Post proning pf ratio improved spo2- 95 % on fio2- 60 %. Prone responder
- Underwent 24 hours of proning

6.2. Day 2

- Persistent shock still on triple vasopressors
- Had undergone one session of sled.
- Shock in sepsis secondary to excessive pro inflammatory mediators.
- Role of hemoperfusion. What does SSC 2021 say about it.

59. For adults with sepsis or septic shock we suggest against using polymyxin B hemoperfusion.	***Weak,*** *low quality of evidence*	**NEW from previous:** "We make no recommendation regarding the use of blood purification techniques"
60. There is insufficient evidence to make a recommendation on the use of other blood purification techniques.	***No recommendation***	

Image Source: Image extracted from The surviving sepsis campaign bundle:(2021 Update) – My Sepsis

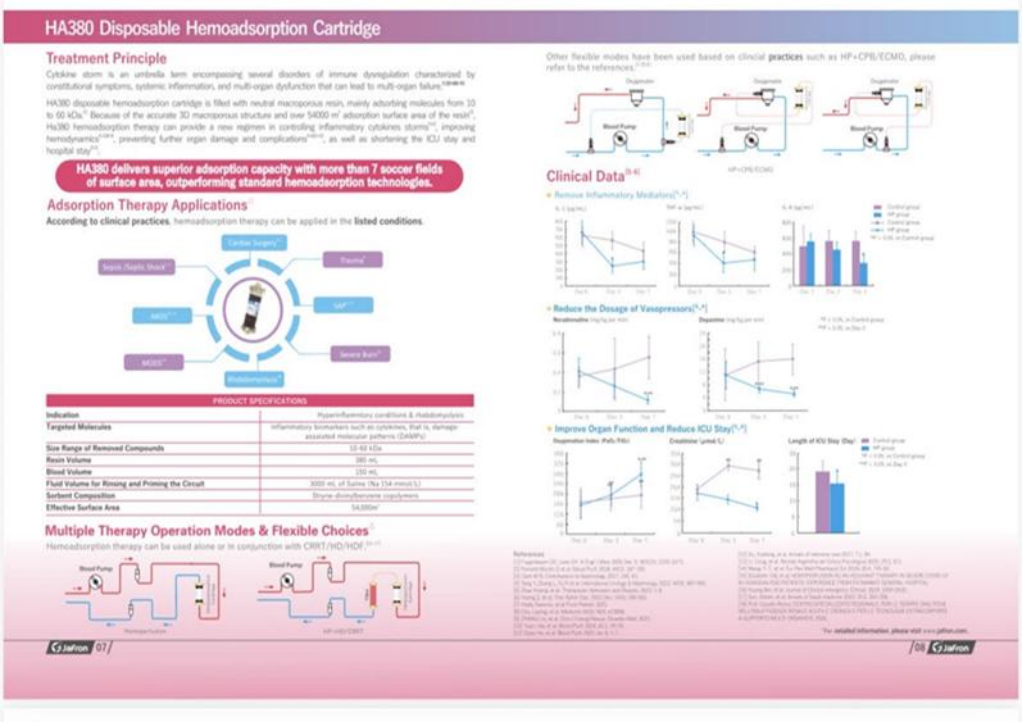

Image Source: Bottom Section: Jafron's HA380 product catalogs.

7. Subsequent course

- Patient gradually weaned off from vasopressors
- Endotracheal c/s- Elizabeth meningoseptica kingae. Antibiotics adjusted as per susceptibility reports
- Had a difficult weaning (failed 3 SBT trials).
- Extubated successfully by day 8 of ICU admission.

8. Case 3

8.1. Clinical Presentation

- Patient Profile: 28-year-old female.
- Pertinent History: Past history of Pulmonary TB.Recent LSCS (4 months ago).
- Chief Complaints: Fever (5 days).Acute Shortness of Breath (2 days).
- Initial Management: Respiratory distress led to intubation at an outside facility before transfer.

8.2. Emergency Department Status

- Hemodynamics: Profound shock requiring triple vasopressors to maintain MAP.
- Invasive Monitoring: Central and arterial lines secured upon arrival.
- Laboratory Findings: TC: 24,000 cells/mm^3 (Significant leukocytosis).Procalcitonin: >100 ng/mL (Indicative of severe bacterial sepsis).Lactate: Rising/Worsening (Signal of tissue dysoxia).

8.3. Radiographic & Empiric Therapy

- CT Chest: Right upper lobe (RUL) consolidation.Differential Diagnosis:Bacterial Pneumonia (Gram-positive vs. Gram-negative).
- Empiric Coverage: Immediate initiation of broad-spectrum antibiotic coverage (GP + GN coverage).

8.4. Clinical dilemma

- Refractory Shock Status: Despite optimal antibiotic therapy and fluid resuscitation, the patient remained vasopressor dependent.

- Complications: Persistent high dose catecholamines with worsening metabolic acidosis (rising lactates).
- Decision Point: Consideration of Extracorporeal Blood Purification (EBP) to modulate the hyperinflammatory response.

8.5. Intervention: Hemoperfusion

- Procedure: One session of Hemoperfusion (HP) initiated.
- Rationale: Removal of middle-molecular-weight inflammatory cytokines.
- Reduction of the "cytokine storm" to restore vascular sensitivity to vasopressors.
- Interruption of the sepsis-induced organ failure cascade.
- Clinical Response & Recovery Hemodynamic Shift: Decrease in vasopressor requirements following the HP session.
- Metabolic Improvement: Stabilization and subsequent clearance of serum lactates.
- Respiratory Progress: Improved lung mechanics and gas exchange.
- Outcome: Successful weaning from mechanical ventilation and titration off all vasopressor support.