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Strategies to Optimize Nutrition in Extracorporeal Membrane Oxygenation (ECMO) Therapy Patients

Disclosures:
I have no commercial relationships to disclose

Presentation Overview:
Nutrition Support for patients on ECMO (Extra Corporeal Membrane Oxygenation) is difficult due to the presence of vasoactive medication, hemodynamic instability and the potential risk for ischemic bowel. The critical care guidelines, in general, don’t address this specific subset of patients. A review of the literature suggests that enteral feeding, starting early, is safe. However, it may be difficult to achieve optimal feeds. The VIS Score (Vasoactive Inotrope Support Score) is a helpful tool to assess the maximum vasoactive dosages that are safe for enteral feeding. There are new techniques to estimate REE, for patients on ECMO, which may help guide clinicians in knowing when optimal nutrition support is achieved. The use of PN in patients on ECMO has not been thoroughly studied, though it is utilized, and may be helpful in achieving nutritional goals.

Objectives:
At the conclusion of the presentation, the learner will be able to:

- Acknowledge the safety of enteral feeding for patients on ECMO
- Assess which pressor dosages are safe for enteral feeding
- Understand the Vasoactive Inotropic score and its use to help guide enteral feeding
- Perceive barriers to reaching goal calories/protein and strategies for improvement
- Know how to assess caloric needs for the ECMO patient
- Discuss the use of PN in ECMO patients

Fast Facts:
It is safe to start enteral feeds early.
It is safe to feed, enterally, at a VIS score of < 14
Minimizing npo for procedures should help achieve optimal nutrition
Indirect Calorimetry and blood gases pre and post the oxygenator can be utilized to assess REE
PN May be utilized to reach nutrition goals
Learning Assessment Questions:

1. Gastric feeding while on ECMO is safe to start early.
   A) True B) False

2. Using the VIS Score: when would you hold feeds?
   A) epi .04 and vaso .04, B) epi at .15  C) Levo .02 and dopa 5 and milrinone 0.125

3. Barriers to adequate feeding on ECMO:
   A) Holding feeds for procedures B) high GRV C) A and B

4. To estimate energy needs while on ECMO do the following:
   A) Predictive equations B) Indirect Calorimetry C) Indirect Calorimetry added to V02 and VC02 from Blood draws pre/post oxygenator or per the “De Waele protocol”

5. When feeding patients on ECMO use:
   A) Semi-elemental B) Polymeric formula C) Either formula

6. Using PN while on ECMO is contraindicated:
   A) True B) False

Learning Assessment Answers:

1. A. True : Recent literature supports safety
2. B. Epi at 0.15 : This equals a VIS score of 15
3. A. and B: Holding feeds for npo and GRV decreases enteral infusion
4. C. Indirect Calorimetry added to V02 and VC02 from Blood draws pre/post oxygenator or per “De Waele protocol” : New literature shows how to estimate REE from blood draws and IC
5. C. Either formula: Recent literature shows both are safe
6. B. False: More studies need to be done, but currently it appears appropriate

References:

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Learning Objectives

- Acknowledge the safety of enteral feeding for patients on ECMO
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Pathophysiology

- At rest, 20-25% of cardiac output is distributed to the splanchnic circulation
  -- Accounts for 30% overall oxygen consumption
- When eating, blood flow to the splanchnic circulation can double
  -- Postprandial hyperemic response

What is the issue?

EN administration would increase intestinal oxygen demand and splanchnic blood flow due to vasoconstriction

Shock Pathophysiology

- Splanchnic and peripheral tissue vasoconstriction
- Oxygen supply/demand imbalance in intestines
- Intracellular edema, necrosis, and apoptosis
- Rupture of the intestinal epithelial layer, favoring bacterial translocation
- Pro-inflammatory response and multi-organ dysfunction

Signs of Intestinal Ischemia

<table>
<thead>
<tr>
<th>Clinical</th>
<th>Laboratory</th>
<th>Radiological</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Gastric residue &gt; 500ml</td>
<td>• Hyperlactacidemia</td>
<td>• Without significant alterations (20-25%)</td>
</tr>
<tr>
<td>• Abdominal bloating</td>
<td>• Metabolic acidosis</td>
<td>• Intestinal pneumatosis</td>
</tr>
<tr>
<td>• Intense abdominal pain</td>
<td>• Leukocytosis</td>
<td>• Free fluid</td>
</tr>
<tr>
<td>• Intraabdominal pressure &gt; 15mmHg</td>
<td></td>
<td>• Dilated and thickened bowel loops</td>
</tr>
<tr>
<td>• Ileus</td>
<td></td>
<td>• Air in portal vein or pneumoperitoneum</td>
</tr>
<tr>
<td>• Oliguria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Shock</td>
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</tbody>
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So far:

• Appears safe to start early
• Nonnutritive benefits to starting early
• Slow advance may be advantageous
• Include IVF and Propofol calories
• Appears safe with VIS score ≤ 10
• Feed with Caution with VIS score > 14
• Monitor gastric residuals, abdominal exam, lactate trends, hemodynamic changes
• Favor semi-elemental, lower osmolality

The BIG QUESTION IS: HOW MUCH?
ECMO: Estimating REE 2018

• Energy expenditure of patients on ECMO: A prospective pilot study
  Elisabeth De Waele, Joop Jonckheer, Joeri J. Pen, Joy Demol, Kurt Staessens, Luc Puis, Mark La Meir, Patrick M. Honoré, Manu L. N. G. Malbrain, Herbert D. Spapen

• Quite interesting

IC and Blood Draws Pre and Post Oxygenator


• Lung IC Measurement+ BGA from pre and post ECMO membrane

• Use the model published by Dash and Basingthwaighte to determine O2 and CO2 content in blood pre and post membrane

• VV ECMO

• None of the equations matched the Energy Expenditure

• Presence of VV ECMO did not effect REE

Insert Elisabeth chart

Nutrirea – 2 Study Design

• Randomized Controlled Enteral vs Parenteral ICU, Vent, Vasoactives

  Started nutrition within 24 hrs of intubation

  PN for at least 72 hrs, then either EN if stable or PN up to 7 days

  Day 8 switched to EN, regardless of hemodynamic stability

  Primarily on Norepi, 12% were on 2 drugs

  EN: started at goal rate, polymeric, isosmotic formula

  20-25 kcal/kg 1st week, 25-30 kcal/kg 2nd week

  Primary: 28 day mortality
Nutria - 2 Outcomes

- Enteral Nutrition did not reduce mortality or secondary infections and is associated with greater risk of digestive complications than PN.
- Started at goal rate
- Fed on norepi of:  
  - Did not say if included other cals
  - Avg of 20 kcal/kg

Questions

- Gastric feeding on ECMO is safe to start early.
  - A) True B) False
- Using the VIS Score: when would you hold feeds?
  - A)epi .04 and vaso .04 B) epi at .15 C)Levo .32 and deps b and minitro 0.125
- Barriers to achieving adequate feeding on ECMO are:
  - A)Holding feeds for procedures B)high GRV (C) A and B
- To estimate energy needs while on ECMO do the following:
  - A)Predictive equations B)direct Calorimetry: C)direct Cardiometry added to VO2
  - B)VO2 from blood draws prepost oxygenator or per “De Waele protocol”
- When feeding patients on ECMO use:
  - A) Semi-elemental B) Polymeric formula C) Either formula
  - A) True B) False

Answers

- Gastric feeding on ECMO is safe to start early.
  - A) True
- Using the VIS Score: when would you hold feeds?
  - B) Epi at .15
- Barriers to adequate feeding on ECMO:
  - A)Holding feeds for procedures B)high GRV C) A and B
- To estimate energy needs while on ECMO do the following:
  - B)Direct Calorimetry added to VO2 and VCO2 from Blood draws prepost oxygenator or per “De Waele protocol”
- Feed patients on ECMO with:
  - A) Semi-elemental B) Polymeric formula C) Either formula
  - A) True B) False

References

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