Parenteral Nutrition Monitoring in the Short Bowel Population

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Disclosure Information

I have no financial conflicts of interest to report related to this presentation

Objectives

Identify risk factors associated with the development of parenteral nutrition associated liver disease (PNALD) in the short bowel patient
Discuss potential interventions for the treatment and management of PNALD
List important laboratory parameters that should be monitored for patients on long term parenteral nutrition
Patient Case

- CM is a 4 month old infant with a history of short bowel syndrome secondary to intestinal atresia
- He has approximately 20 cm of small bowel, no ileocecal valve, and 1/3 of his colon remaining
- Has been receiving parenteral nutrition since birth
- Enteral feeds currently on hold because of diarrhea and increased stool frequency
- His total bilirubin is 5mg/dL, direct 3.4mg/dL, AST 132 IU/mL, ALT 166 IU/mL, GGT 174 IU/mL
- CM has now been referred to the intestinal rehabilitation program for continued management of his short bowel syndrome

CM’s Parenteral Nutrition Formula

- Weight 5kg
- Volume 600mL infused over 24hrs
- Macronutrients
  - Amino acids 2.5gm/kg/day
  - Dextrose 18gm/kg/day
  - Lipids 2.5gm/kg/day
- Micronutrients
  - Sodium 4meq/kg/day
  - Potassium 3meq/kg/day
  - Chloride 4meq/kg/day
  - Calcium 1.5meq/kg/day
  - Phosphorus 1mmol/kg/day
  - Magnesium 0.5meq/kg/day
  - Standard multivitamin
  - Standard trace element solution

WHAT RISK FACTORS FOR PARENTERAL NUTRITION ASSOCIATED CHOLESTASIS DOES CM HAVE?
Risk Factors Implicated in Development of PNALD
(Nutrition in Clinical Practice 2006;21:279-290)

- Multifactorial
  - Duration of parenteral nutrition
  - Lack of enteral stimulation
  - Sepsis
  - Excessive calories
  - Parenteral nutrition components
    - Recent focus on role of lipid emulsions in PNALD

Lipid Emulsion Formulations
(Hojsak, et al. JPGN 2016;62:776-792)

<table>
<thead>
<tr>
<th>Fat Emulsion</th>
<th>SO</th>
<th>Linoleic acid (%)</th>
<th>Linolenic acid (%)</th>
<th>Phytosterol Content (mg/L)</th>
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<tbody>
<tr>
<td>Intralipid 20%®</td>
<td>100% Soybean</td>
<td>53</td>
<td>8</td>
<td>348</td>
</tr>
<tr>
<td>ClinOleic 20%®</td>
<td>20% Soybean/80% Olive</td>
<td>18.7</td>
<td>2.3</td>
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<td>30% Soybean/30% MCT/30% Olive/15% Fish</td>
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<tr>
<td>Omegaven 10%®</td>
<td>100% Fish</td>
<td>4.4</td>
<td>1.8</td>
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</table>

What Changes Can Be Made to the Lipid Component?

- Dose restriction
- Lipid formulation substitution
Laboratory Monitoring Considerations for Patients on Long Term Parenteral Nutrition

- Weekly: Complete metabolic panel, triglycerides, GGT
- Iron studies
- Trace metal panel
- PT/INR, vitamin A, D, E levels
- B12 level
- Carnitine studies
- Thyroid studies

Trace Element Solution

Pediatric Trace Metal Solution (per 0.2mL)
- Copper 20mCg
- Manganese 5mCg
- Chromium 0.2mCg
- Zinc 200mCg

Adult Trace Metal Solution (per 1mL)
- Zinc 5000mCg
- Copper 1000mCg
- Manganese 500mCg
- Chromium 10mCg
- Selenium 60mCg

Consequences of Abnormal Trace Metal Levels

- Low levels
  - Zinc- diarrhea, rash
  - Copper- neutropenia
  - Manganese- unknown
  - Chromium- hyperglycemia
  - Selenium- alopecia, cardiomyopathy

- Elevated levels
  - Zinc- copper deficiency?
  - Copper- hepatotoxicity
  - Manganese- neurotoxicity
  - Chromium- nephropathy
  - Selenium- brittle nails, fatigue
WHAT LABS SHOULD WE CONSIDER ORDERING?
WHAT POTENTIAL CHANGES TO CM’S PARENTERAL NUTRITION FORMULA SHOULD BE MADE?

References


