Utility of Olive Oil-Based Lipid Emulsion as an Alternative Fatty Acid Source in Home Parenteral Nutrition Patients

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BACKGROUND

Lipids are a critical source of calories and key in preventing essential fatty acid deficiency in patients unable to obtain caloric needs via the enteral route. 1

The high omega-6 content of soybean oil, the most common type of lipid emulsion for parenteral nutrition, makes this lipid source pro-inflammatory in nature. 2

Patients receiving soybean-only products are subject to complications related to liver dysfunction and elevated triglycerides and potentially immune dysfunction. 3

Alternative oil sources—fish oil, olive oil, and medium chain triglycerides—possess different inflammatory profiles, favoring omega-3 and omega-9 in place of omega-6. 4

This study intends to determine the impact of inflammatory-neutral olive oil lipid emulsion product on stability of hepatic and immune system function.

AIMS

• To examine the effect of olive-oil, soybean oil-intravenous lipid emulsion (OO-ILE) on liver and immune function. AST, ALT, alkaline phosphatase, total bilirubin, and triglycerides were examined as surrogate markers of liver function and white blood cell count as an indicator of immune function.

• To evaluate the impact of OO-ILE on lipid emulsion-naïve patients. Liver function stability was determined by elevations of AST, ALT, alkaline phosphatase, total bilirubin, and triglycerides, while white blood cell count was recorded to evaluate effect on immune function.

• To describe incidence of hospitalization in patients receiving OO-ILE. Hospitalization rate was determined based on documented hospital admission prompting interruptions in home parenteral nutrition delivery.

METHODS

• Prospective observational study across 3 dispensing sites

• Two cohorts: patients switching from SO-ILE to OO-ILE and patients newly started on OO-ILE

• AST, ALT, alkaline phosphatase, total bilirubin, triglycerides, and WBC count were collected from laboratory data obtained prior to OO-ILE initiation for patients switching therapies.

• Hospital admission data during the study period was recorded.

• Follow-up liver and immune functions tests were collected 90-120 days following OO-ILE initiation.

RESULTS

<table>
<thead>
<tr>
<th>Patient Group</th>
<th>n=28</th>
<th>Before Transition (Mean)</th>
<th>After Transition (Mean)</th>
<th>Significance (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AST</td>
<td>42</td>
<td>40</td>
<td>0.53</td>
<td></td>
</tr>
<tr>
<td>ALT</td>
<td>44</td>
<td>34</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>Alkaline Phosphatase</td>
<td>209</td>
<td>163</td>
<td>0.11</td>
<td></td>
</tr>
<tr>
<td>Total Bilirubin</td>
<td>0.53</td>
<td>0.64</td>
<td>0.24</td>
<td></td>
</tr>
<tr>
<td>Triglycerides</td>
<td>114</td>
<td>110</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>WBC</td>
<td>7.3</td>
<td>6.7</td>
<td>0.43</td>
<td></td>
</tr>
</tbody>
</table>

**AST= Aspartate Aminotransferase, ALT= Alanine Aminotransferase, WBC= White Blood Cells**

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<tr>
<th>Patient Group</th>
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<th>Before Transition (Mean)</th>
<th>After Transition (Mean)</th>
<th>Significance (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lipid-Naïve (Mean)</td>
<td>38</td>
<td>40</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>AST</td>
<td>142</td>
<td>103</td>
<td>6.2</td>
<td></td>
</tr>
<tr>
<td>ALT</td>
<td>0.75</td>
<td>6.2</td>
<td>0.43</td>
<td></td>
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**Causes of Hospitalization**

- Infection (3)
- Renal Dysfunction (1)
- Gastrointestinal Complication (3)
- Multifactorial (2)
- Hematologic Abnormality (2)
- Unknown (3)

DISCUSSION

• No significant differences were observed between groups, though similar lab profiles could indicate comparable safety profiles. Hospitalization rate over the study period was consistent with previously reported 30-day readmission rates with hospitalized patients discharged home on parenteral nutrition. 5

• As patients were not switched based on existing dysfunction, improvement in some patients may be obscured by normal hepatic or immune system function in patients with neutral response to the OO-ILE. 6

• Improvement from OO-ILE may be mitigated by disease progression over the course of the study; however, OO-ILE could be delaying worsening patient trajectory. Changes in immune function could also be mediated by components of the immune system other than WBCs, such as inflammatory mediators or cytokines.

• A larger sample size could elucidate small but significant differences between the two emulsion types. Likewise, longer follow-up may be needed to see differences in liver function tests or immunological markers.

• Previous exposure to lipid emulsion products outside our pharmacy’s service was unknown, and time on SO-ILE prior to initiation was not captured or analyzed.

CONCLUSION

• Given that no significant differences were seen among endpoints evaluated and hospitalization rates were similar to historical data for patients on parenteral nutrition, OO-ILE and SO-ILE may have comparable safety profiles.

• In instances of drug shortages, these products may be interchanged to provide consistent patient care and prevent interruption in therapy.

REFERENCES


Disclosure:

- None of the authors received any financial compensation in relation to this study.