Micronutrient Deficiencies are Difficult to Predict in Patients on Home Parenteral Nutrition

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Introduction

- Micronutrient deficiencies have been reported in patients on home parenteral nutrition (HPN) (Vanek et al 2012 Nutr Clin Pract, 27:440)
- ESPEN guidelines recommend vitamin and trace element concentrations are measured at the onset of HPN and then at least once a year thereafter (Pironi et al 2016, Clin Nutr, 35:247)
- These recommendations are based on expert opinion as evidence-based guidelines are not yet available
Aim

● To assess the micronutrient status of stable HPN patients under the care of a tertiary referral centre in the UK

● To assess whether there are any factors associated with micronutrient deficiencies
Method

- All patients on home parenteral support screened for stability
- Patients excluded if they were on home parenteral fluids or if they had been on HPN for <6 months, had undergone surgery or a change in micronutrient provision in the previous 6 months
- To avoid the effect of the acute phase response samples were excluded if C-reactive protein (CRP) >15mg/L (Duncan et al 2012, Am J Clin Nutr, 95:64)
- Retrospective analysis of venous blood samples from stable patients for vitamins A, E, D, B12, folate, zinc and selenium undertaken January 2012 - February 2014
- Demographic data was collected including age, sex, aetiology, intestinal anatomy and body mass index (BMI)
- Number of days/week on HPN, Cernevit® and Addittrace® were recorded
In patients with micronutrient deficiencies, univariate and multivariate analyses were performed to determine if demographic categories or frequency of HPN, Cernevit® or Additrace® were significant.
Results – inclusion/exclusion

Samples assessed for eligibility n=226

- On home parenteral fluids n=28
  - On HPN <6 months n=7
  - Surgery within last 6 months n=8
  - Change in micronutrient provision in last 6 months n=42
    - CRP >15mg/L n=18
    - Other n=33

Samples included n=93
Results - Demographics

33M:60F, mean age 54±14 years, mean BMI: 21.8±3.1kg/m²

Patient aetiology:
- IBD: 30%
- Mesenteric: 24%
- Surgical: 15%
- Dysmotility: 6%
- Other: 25%

Frequency of HPN, Cernevit® and Additrace®:

<table>
<thead>
<tr>
<th>Product</th>
<th>Mean number of days per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPN</td>
<td>5.7±1.5 (range 2-7)</td>
</tr>
<tr>
<td>Cernevit®</td>
<td>4.7±1.6 (range 2-7)</td>
</tr>
<tr>
<td>Additrace®</td>
<td>5.7±1.6 (range 2-7)</td>
</tr>
</tbody>
</table>
Percentage of patients with low, normal and high serum vitamin concentrations
Percentage of patients with low, normal and high trace element concentrations
Factors associated with micronutrient deficiencies

<table>
<thead>
<tr>
<th>Micronutrient</th>
<th>Significant associations on univariate analysis</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>Age &lt; 50 years</td>
<td>0.02</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>Male</td>
<td>0.02</td>
</tr>
<tr>
<td>Zinc</td>
<td>Surgical complications</td>
<td>0.007</td>
</tr>
<tr>
<td></td>
<td>BMI &gt; 25kg/m²</td>
<td>0.01*</td>
</tr>
<tr>
<td></td>
<td>Additrace® ≤ 4 days/week</td>
<td>0.06</td>
</tr>
<tr>
<td>Selenium</td>
<td>Surgical complications</td>
<td>0.04</td>
</tr>
</tbody>
</table>

*Multivariate analysis

- No associations were observed for vitamin D
- No associations were observed with intestinal anatomy
Discussion

- Micronutrient deficiencies were observed in our HPN population but age, sex, aetiology, intestinal anatomy, BMI, number of days on HPN, Cernevit® and Additrace® were not consistently associated with deficiencies.

- Vitamin A and D deficiencies may require oral or intramuscular supplementation.

- Vitamin B12 and folate require ongoing monitoring to prevent excess provision from supplementation in addition to Cernevit® in HPN.

- Zinc and selenium deficiencies could be treated with new trace element preparations containing higher amounts.
Conclusion

- To our knowledge this is the largest survey of micronutrient status in stable HPN patients with mixed aetiology
- Current provision of micronutrients meets requirements of the majority of our population as most results fell within normal ranges
- Micronutrient deficiencies and toxicities were observed highlighting the importance of ongoing monitoring as per ESPEN guidelines (Pironi et al 2016, Clin Nutr, 35:247)
- Plan to develop local guidance on micronutrient management