CASE STUDY ON INPATIENT MALNUTRITION

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A 59-year-old white man with a history of diabetes, severe PVD, CKD IV, chronic hepatitis C admitted for non-healing MRSA foot wound and diarrhea for one week. He has completed a 6 weeks course of IV antibiotic therapy for presumptive osteomyelitis. Surgery consultant has offered him partial transmetatarsal amputation of the foot with possible skin grafting. Patient is diagnosed with C. Difficile colitis and treated with oral Vancomycin.

He has a history of borderline personality disorder, lives alone and drinks two beers a day.

Dietary history: decline in oral intake >50% from usual for one month due to nausea. Usual weight 200#, admission weight 180# and BMI 29.56 kg/m2, weight loss ~10%.

Functional Status: reports decreased muscle strength and difficulty ambulating.

Vital signs: temperature 37.5 C, pulse 112, BP 146/83 and RR 14. On physical examination he is pale, chronically ill-appearing man with ascites. Left foot noted for large open wound with purulent drainage. Severe muscle loss at temples, arms/shoulders. Space between ribs is apparent. 3+ pitting edema in both ankles.

Labs: WBC 12.3 x 10 9/L, Hb 9 mg/dL, MCV 78 fl, ALT 84 U/l, AST 68 U/l, creatinine 3.1 mg/dL, glucose 205mg/dL, albumin 2.2 mg/dL, CRP 15 mg/dL. Liver US showed hepatomegaly and moderate ascites.

DISCUSSION

What is the best approach to diagnosis of malnutrition in this patient?

In 2009, the Academy of Nutrition and Dietetics and A.S.P.E.N. (AND-ASPEN) agreed upon an etiology-based approach towards malnutrition diagnosis that incorporates a current understanding of the systemic inflammatory response (1). The use of acute-phase protein laboratory levels (e.g., albumin and prealbumin) as indicators of malnutrition is limited. They are probably indicators of inflammation rather than specific indicators of malnutrition, and they do not typically respond to feeding interventions in the setting of active inflammatory response (3).

Rather than relying on laboratory tests, AND-ASPEN have agreed upon the set of clinical characteristics (described below) to be used in the detection of malnutrition. Patients meeting two or more of these characteristics may be diagnosed with severe or moderate malnutrition (2). Experts agree that it is not possible to accurately distinguish mild malnutrition from normal nutritional status and therefore there are no available criteria to diagnose mild malnutrition at this time. Proposed malnutrition characteristics should be used to standardize the clinician’s approach to the diagnosis and documentation of the presence or absence of adult malnutrition (4).

Is etiology of his malnutrition related to acute, chronic illness or social/environmental/behavioral circumstances?
Review of his clinical history:
- admitted for non-healing MRSA foot wound
- has diarrhea for one week and diagnosed with C. Difficile colitis
- lives alone and drinks two beers a day

The patient has several chronic illnesses, including chronic wound infection, diabetes, hepatitis C and CKD. He was admitted for C. Difficile colitis, an acute infection. Living alone and having drinking problem coincides with social/environmental/behavioral circumstances etiology. The etiology of malnutrition in his case is multifactorial.

What are the objective signs of inflammation in this case?

Clinical and laboratory data that may be used as inflammatory markers include: hyper/hypothermia, tachycardia, leukocytosis, hyperglycemia, low albumin and prealbumin, negative nitrogen balance and CRP.

Our patient’s inflammatory markers:
- pulse 112
- WBC 12.3 x 10^9/L
- glucose 205mg/dL
- albumin 2.2 mg/dL
- CRP 15 mg/dL

What clinical characteristics are supporting the diagnosis of malnutrition?

AND-ASPEN clinical characteristics to be used for diagnosis of malnutrition

* Insufficient energy intake
* Unintentional weight loss
* Loss of muscle mass
* Loss of subcutaneous fat
* Edema (may mask weight loss)
* Diminished functional status

AND-ASPEN Malnutrition Diagnostic Criteria of Estimated Energy Requirement in the Context of Etiology:

<table>
<thead>
<tr>
<th></th>
<th>Moderate Malnutrition</th>
<th>Severe Malnutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Illness or trauma</td>
<td>&lt;75% For &gt;7 days</td>
<td>≤50% For ≥ 5 days</td>
</tr>
<tr>
<td>Chronic Illness</td>
<td>≤75% For ≥1 month</td>
<td>&lt;75% For ≥1 month</td>
</tr>
<tr>
<td>Social/Environmental/Behavioral</td>
<td>&lt;75% For ≥3 month</td>
<td>≤50% For ≥1 month</td>
</tr>
</tbody>
</table>
Dietary history: decline in oral intake >50% from usual for one month due to nausea. Patient lives alone and drinks two beers a day. He also has diarrhea leading to decreased absorption of nutrients. Deficiency of group B vitamins especially thiamine and niacin are often seen in alcoholics. In the contest of acute illness and social/environmental/behavioral etiology, our patient meets criteria for severe malnutrition.

* Unintentional weight loss:

AND-ASPEN Malnutrition Diagnostic Criteria of Weight Loss:

<table>
<thead>
<tr>
<th>Weight Loss</th>
<th>Acute Illness</th>
<th>Chronic Illness</th>
<th>Social/Environmental/Behavioral</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Moderate</td>
<td>Severe</td>
<td>Moderate</td>
</tr>
<tr>
<td>1 week</td>
<td>1-2%</td>
<td>&gt;2%</td>
<td>N/A</td>
</tr>
<tr>
<td>1 month</td>
<td>5%</td>
<td>&gt;5%</td>
<td>5%</td>
</tr>
<tr>
<td>3 month</td>
<td>7.5%</td>
<td>&gt;7.5%</td>
<td>7.5%</td>
</tr>
<tr>
<td>6 month</td>
<td>N/A</td>
<td>N/A</td>
<td>10%</td>
</tr>
<tr>
<td>1 year</td>
<td>N/A</td>
<td>N/A</td>
<td>20%</td>
</tr>
</tbody>
</table>

Patient’s calculated weight loss is 10% for one month. Weight change is not an accurate reflection of malnutrition in this case because edema is masking weight loss. 10% weight loss is severe under these circumstances.

* Physical examination:

Patient has severe muscle loss at temples, arms/shoulders. Space between ribs is apparent. In our case, physical examination provided evidence of severe muscle wasting and moderate subcutaneous fat loss.

* Diminished functional status

Patient reports decreased muscle strength and difficulty ambulating. AND-ASPEN recommends handgrip assessment as criteria for diminished function. It was not available in our case. Adoption of handgrip requires training and dissemination of equipment.

What is the severity of malnutrition?

A minimum of 2 of the 6 clinical characteristics of malnutrition is recommended for diagnosis of either severe or moderate malnutrition. Differencing between moderate and severe malnutrition is often a challenge.

Our patient’s degree of insufficient energy intake, unintentional weight loss and loss of muscle mass (3 out of 6 characteristics), all meet diagnostic criteria for severe malnutrition.
Possible Scenarios of Malnutrition Clinical Characteristics for Determining Severity:

<table>
<thead>
<tr>
<th># of Clinical Characteristics</th>
<th>Moderate Malnutrition</th>
<th>Severe Malnutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 2 Moderate</td>
<td>Yes</td>
<td>N/A</td>
</tr>
<tr>
<td>≥ 2 Severe</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>1 Severe and ≥ 1 Moderate</td>
<td>Yes</td>
<td>N/A</td>
</tr>
<tr>
<td>1 Moderate</td>
<td>No Malnutrition but may be at risk</td>
<td>N/A</td>
</tr>
<tr>
<td>1 Severe</td>
<td>N/A</td>
<td>At risk for Malnutrition</td>
</tr>
</tbody>
</table>

Patient Diagnosis: Severe protein-calorie malnutrition (ICD-10: E43)

Case continuous: the patient underwent successful partial amputation of the left foot and C. Difficile colitis has resolved. He had a prolonged hospital stay due to difficulties with finding a placement. Plastic Surgery team stated that they will only perform a skin grafting after his serum albumin is above 3.5. His oral intake improved and he was taking between 75 and 100% of his meals. Patient was started on night time tube feeding for pre-operative nutritional support. He gained 5# without evidence of worsening lower extremities edema or ascites. Serum albumin increased from 2.2 → 2.7 mg/dL, and after 3 weeks of supplemental nocturnal tube feeding it was discontinued.

Was low albumin a reliable marker of malnutrition in this patient?

No. Low serum albumin is not always an indicator of malnutrition. Plasma albumin concentration controlled by rate of albumin synthesis, the fractional catabolic rate, albumin distribution between the vascular and extravascular compartments, and exogenous loss of albumin. Patients with liver or kidney disease (our patient has both) may have low albumin due to impaired synthesis and increased losses regardless of nutritional status. As discussed, low serum albumin is a marker of an inflammatory state (our patient had acute and chronic infection/inflammation).

Was a nutrition intervention (tube feeding) appropriate?

No. Many studies demonstrated that low serum albumin level is associated with poor wound healing, increased nosocomial infections, LOS and in-hospital mortality, and generally is a poor predictor of clinical outcome. However, with our current knowledge it is clear that supplemental tube feeding was not indicated for this patient. He had good appetite, desired oral intake and his GI symptoms were resolved. Tube feeding would not increase serum albumin level but increase risk of overfeeding in this case.

Sources:
