Nutritional Status Assessment in the Elderly

Laboratory Test Assessment in Pharmacy Practice

NBPA/CSHP NB AGM

May 30/10

Nutrition and Function

Function =

$$\frac{\text{physical capabilities x medical management x motivation}}{\text{social, psychological and physical environment}}$$

Laboratory parameters unchanged due to aging

- Hemoglobin (Hgb) & Hematocrit (Hct)
- WBC and platelet counts
- Electrolytes
- BUN
- Liver function tests
- Free T 4
- TSH
- Calcium, phosphorus, magnesium

Abnormal values should prompt further evaluation

Nutrition and Function

- Decreased energy and protein intake
  - Low lean body mass, sarcopenia, muscle weakness
  - Nutrient deficiencies (B12, folate, vitamin D, Ca, Fe) impact negatively on balance, postural stability, cognition
  - Increased frequency of falls can be directly related to Vitamin D and Folate deficiencies

Factors that increase Older Adults risk for malnutrition

- Drugs (digoxin, antitumour agents, metformin, PPI's)
- Chronic disease (CHF, renal insufficiency, chronic GI disease)
- Depression
- Dental & periodontal disease
- Decreased taste and smell
- Low socioeconomic level
- Physical weakness
- Isolation

Patient case

- Mrs. Smith is 78 y.o She lives alone in her own condominium apartment. Today she has an appointment with you for a medication review. You had suggested this to her as over the past 3 to 4 months you'd noted that she was sometimes up to a week or more late in refilling her prescriptions and that she seemed to be losing weight.

- Mrs. Smith arrives 15 min late for her appointment carrying a large bag of medications. During the interview, she tells you that she has been experiencing numbness and a "pins and needles" type sensation in her lower legs and feet for about 3 months. She also reports having falls one to two times per week.

Patient Case

- HT: 150 cm WT: 56 kg BP: 154/60
  Random glucose: 10.8
- Medical problems: Diabetes, Type 2; Systolic hypertension; Dyslipidemia; GERD; Osteoporosis
- Medications: Gliclazide 80 mg bid; Metformin 500mg tid cc; Nifedipine XL 60 mg od; Ramipril 10mg daily; Atorvastatin 40 mg daily; Ranitidine 150 mg qhs; Omeprazole 20 mg bid; Alendronate 70 mg qweekly; Oscal D 1 od; EC ASA 81 mg od

Patient Case

- Discussion points:
  - Do you suspect that one or more of Mrs. Smith's medications could be contributing to her symptoms of numbness, etc., falls and possible decline in memory?
  - If so, which meds would be of most concern and why?
  - What laboratory test information would be useful at this time?

Vitamin B12 & Folate deficiency

- Necessary for normal RBC formation, tissue & cellular repair, DNA synthesis
- Body stores of B12 are adequate for 3-5 yrs and folate for several months
- Accompanied by macrocytic anemia
- Clinical symptoms include:
  - Confusion, paranoia
  - Dizziness, fatigue, weakness
  - Loss of coordination of legs & feet
  - Loss of appetite; abnormal taste, smell
  - Tachycardia, SOB
  - Sore tongue & mouth
  - Paresthesias

Vitamin B12 & Folate Deficiency

- Tests used to diagnose and monitor B12 & folate deficiency
  - Serum B12 and folate levels – need to check both
  - CBC – low Hgb; high MCV, MCH,RDW; MCHC wnl; reticulocyte count decreased
  - MMA (methylmalonic acid)
    - Elevated in mild or early B12 deficiency
  - HCYS (Homocysteine)
    - Can be elevated in both B12 & folate deficiency

Vitamin B12 & Folate deficiency

- Tests ordered to determine cause of B12 deficiency
  - Intrinsic factor binding Ab
    - Interferes with B12 binding; present in pernicious anemia
  - Intrinsic factor blocking Ab
    - Prevents B12 from binding to intrinsic factor; present in >50% of those with pernicious anemia
  - Parietal cell Ab
    - Antibody against parietal cells that produce IF

Drug-induced causes

- Metformin
  - Prevalence of 30% for B12 malabsorption
  - Decreases serum B12 levels by 14-30%
  - Mechanism:
    - Interacts with intrinsic factor/B12 complex
    - Ileal Endocyctic receptor – cubilin
    - Impairs calcium availability
  - Risk factors:
    - Daily dose – each 1g/day increment increased risk by 2-fold ($p < .001$)
    - Use of metformin for > 3 yrs
    - Increasing age (gastric atrophy) and vegetarian diet also factors

Drug-induced causes

- Histamine 2 Receptor Antagonists & PPI's
  - Mechanism:
    - Inhibit acid secretion by gastric parietal cells
    - Decreased gastric acid and pepsin are required for cleavage of dietary B12
  - Risk factors:
    - Duration of PPI use > 4 yrs
    - GI side effects from metformin
- Others: colchicine, neomycin,para-aminosalicyclic acid

Calcium Homeostasis

- Av daily Ca++ intake = 2-2.5 g/day
- 99.5% of Ca++ is integrated into bones
- Only 0.5% is extracellular
- There is an inverse relationship between Ca++ and phosphate
- Ca++ is bound mainly to serum albumin (80%) ; if albumin is low, the free concentration of Ca++ is elevated despite a “normal” level

Corrected Calcium concentration

- $Ca_{corr} = ([4.0\text{-albumin}] \times 0.8\ mg/dL) + Ca_{uncorr}$

- Normal serum Ca = 2.1-2.7 mmol/L for patient with serum albumin of approx 4 g/dL
- Serum ionized Ca can also be measured directly; normal range = 1.15-1.38 mmol/L

Drug-Induced hypocalcemia

- Some common causes
  - Drug induced hypermagnesemia
    - Mg in antacids and laxatives; Mg supplements
  - Drug induced hypomagnesemia
    - Cisplatin, diuretics, aminoglycosides
  - Alcohol
  - Calcium chelators: foscarnet; EDTA
  - Drug induced Vitamin D deficiency or resistance:
    - Phenytoin, Pb, carbamazepine, INH, rifampin, theophylline
  - Loop diuretics

Drug-induced Hypocalcemia

- Inhibitors of bone resorption:
  - Bisphosphonates (high dose; potent); estrogens; calcitonin; colchicine overdose
- Drug-induced hyperphosphatemia:
  - Phosphate-containing enemas; antitumour agents
- Proton pump inhibitors (PPI's) & H2-blockers
- Glucocorticoids

Patient case

- Two weeks later, you receive a call from Mrs. Smith's family MD, Dr. I.M. Nice, who had received your medication review report. She tells you the following results of Mrs. Smith's laboratory tests:
- Hgb 87 (115-150 g/L)
- HCT 0.268 (0.338-0.427) L/L
- MCV 112 (83-98) L
- MCH 42 (27.8 – 34.1) pg
- MCHC 335 (332-356) g/L
- Calcium 1.99 (2.10-2.60) mmol/L
- Mg 0.58 (0.70-1.10) mmol/L
- Albumin 37 (35-50) g/L
- B12 72 (140-650) pmol/L
- Folate 360 (340-1360) nmol/L
- TSH 1.5 (0.35-5.0) mIU/L
- Na 138 (136-146) mmol/L
- K 3.7 (3.5-4.8) mmol/L
- BUN 6.0 (3.0-9.0) mmol/L
- Cr 89 (50-98) umol/L
- Chol / HDL ratio 2.2 LDL 1.20 (target is < 2.0 mmol/L)

Patient Case

- Dr. Nice asks if any of Mrs. Smith's medications might be a cause of some of the abnormal laboratory test results.
- Discussion points:
  - Now that you have the lab test results, do you suspect that one or more of Mrs. Smith's medications could be contributing to her symptoms?
  - If so, which medication(s) could be the cause and why?
  - What corrective action could be taken?
  - When would you suggest follow up monitoring of the lab parameters?

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