Vitamins and minerals after bariatric surgeries

4th April 2019

SOReg-N Annual meeting, Bergen.

God ettermiddag ☺

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Faculty-BOMSS (British Obesity & Metabolic Surgery Society) Annual training day

NO CONFLICTS OF INTEREST

LAYOUT OF THE TALK

*Bariatric specialist unit at HUH and my role (2 mins)

*Clinical cases 35mins

*Questions (8-10 mins)

Bariatric MDT team at Homerton University Hospital, London

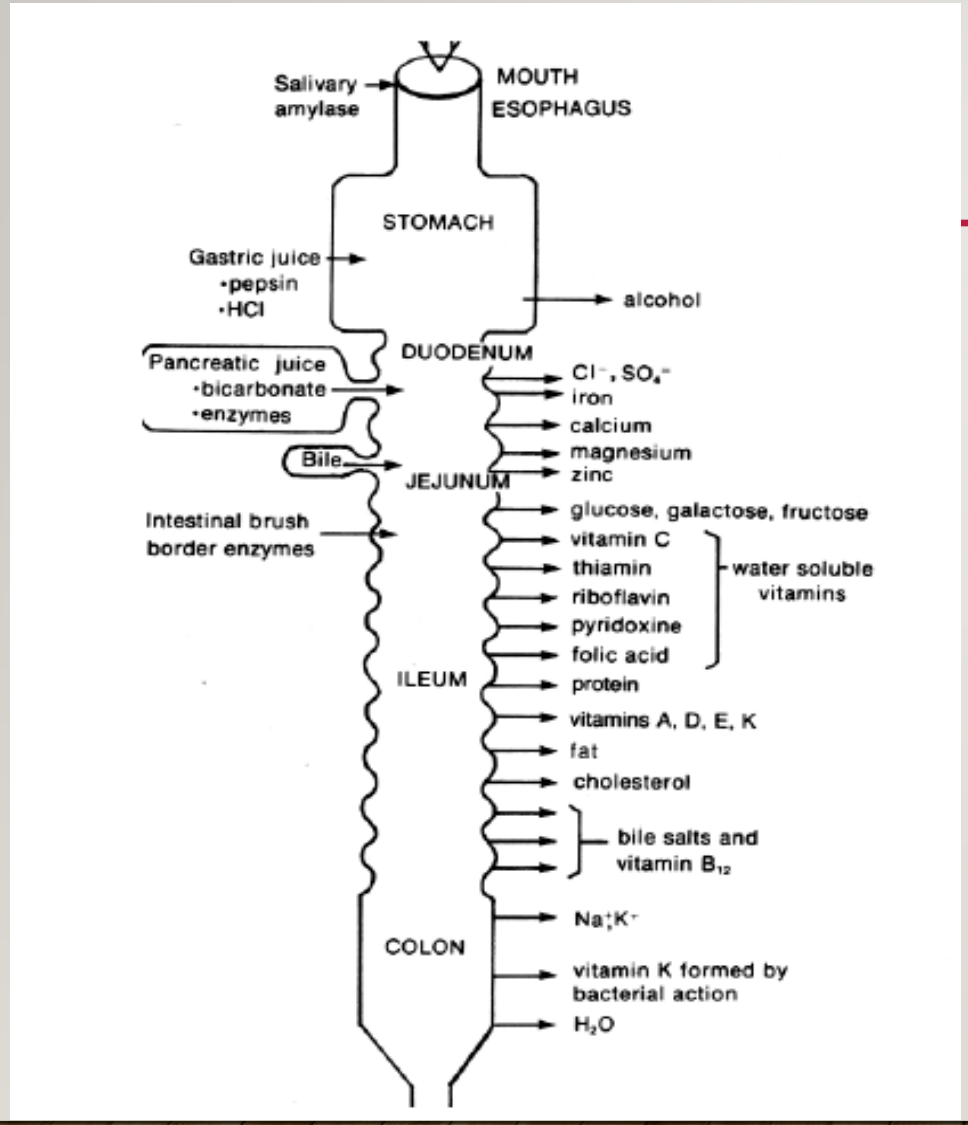
My role:

- Preoperative nutritional and metabolic (NAM) assessment review, diagnosis & optimization of associated medical condition.
- Two outpatient clinics/week- General bariatric clinic and Duodenal switch clinic and regular participation in MDT meetings.
- Medical lead of TOC (Transfer of care) programme for safe discharge of bariatric patients to primary care.
- Medical oversight of inpatients for VAM def. including parenteral treatment of copper, zinc, selenium, vitamin A and vitamin K deficiencies.
- Regular teaching of GPs in the community, UG and PG medics, Trainee surgeons, dieticians and nurses, Cardiology trainees, A & E trainees, Pharmacists and laboratory trainees.
- Advisory role to other bariatric units in the UK

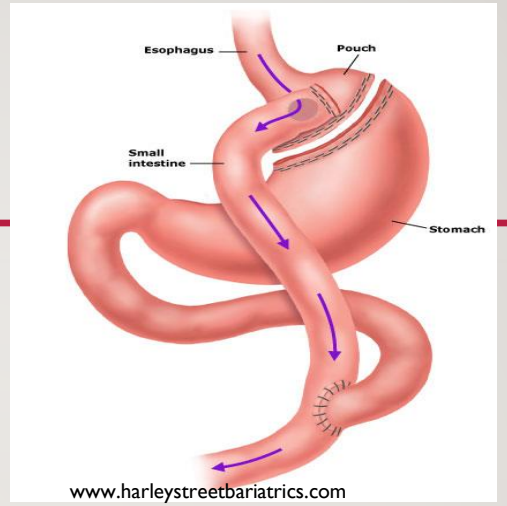
BARIATIC UNIT AT HUH, LONDON

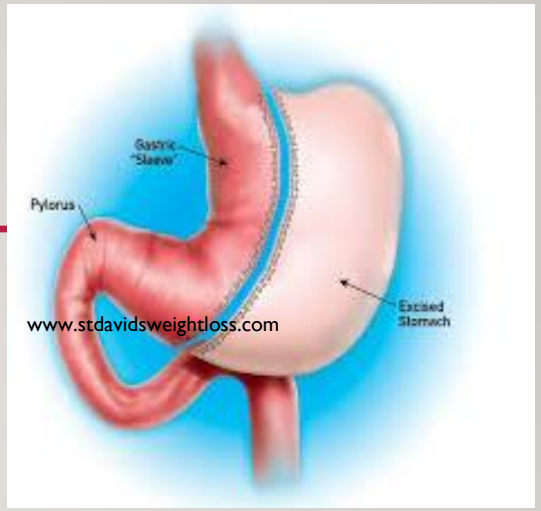
- 6 Consultant Bariatric surgeons, 1 associate specialist, 1 clinical fellow, junior trainee doctors
- 2 Bariatric physicians- 1 endocrinologist, 1 chemical pathologist
- 1 clinical psychologist
- 4 Bariatric specialist dieticians
- 2 Bariatric specialist nurses
- 1 Bariatric specialist anaesthetist
- Bariatric MDT coordinator
- Bariatric specialist physiotherapist
- Surgeries- RYGB, SG, DS, Mini-gastric bypass, gastric banding (as part of trial).

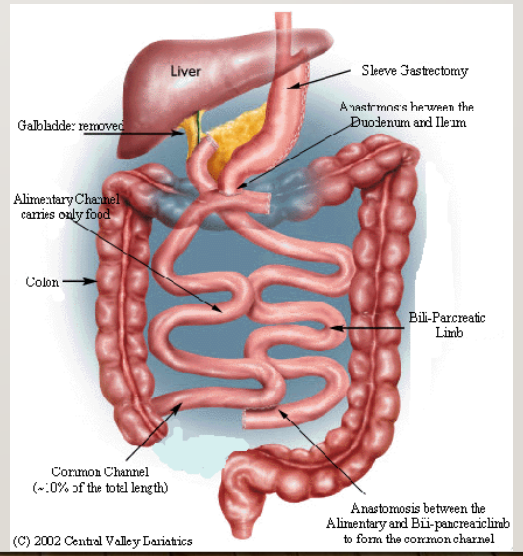
Gut sketch diagram with absorption sites for different nutrients

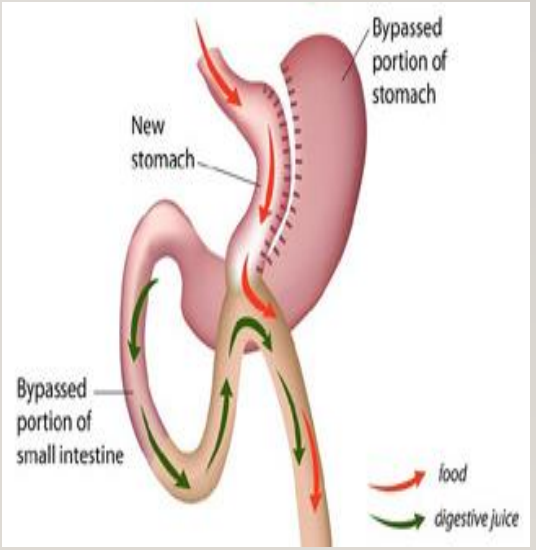


Common bariatric surgeries done at HUH









CASE 1

- 39 year old female, BMI 61/5kg/m^2 with diabetes, hypertension, severe OSA underwent Duodenal switch 4 years ago.

- DM, HT, OSA resolved and BMI stabilized at 34kg/m^2 after 2 years.
- Lost to follow up for 2 and a half years
- Loss of 7 teeth and 2 tibial fractures following recurrent falls, pins and needles in the legs and depression during this period.

Blood tests	Results	Reference range
FBC	109	115-165g/L
Ferritin	5	9-120ug/L
Vitamin D	23	80-150nmol/L
PTH	16.7	1.3-6.8pmol/L
Calcium	2.18	2.2-2.6mmol/L
ALP isoenzymes	80% bone	15-65%
Active B12 (holotranscobalamin)*	18	>35pmol/L
Vitamin B12	384	200-1000 ng/L
MMA	1.5	0.29-0.70

Cobalamin binding proteins
biologically *active* Vs *inactive* fractions

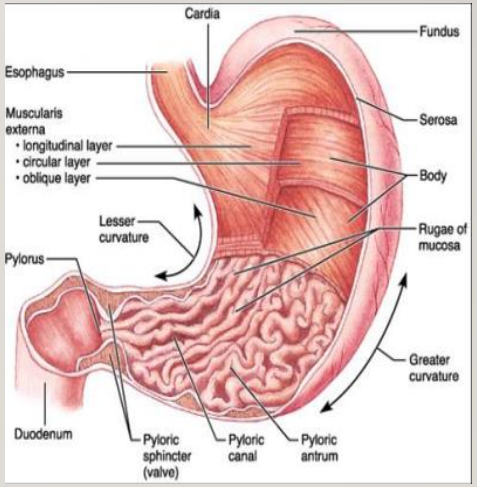
Holotranscobalamin (Biologically active B12) -Around 20% of circulating B12

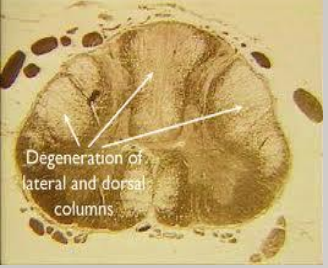
Holohaptocorrin (Biologically inert B12) Around 80% of circulating B12

Holotranscobalamin and MMA levels are routinely done in Homerton Clinical biochemistry lab on bariatric patients as 30% of our patients have shown to have normal vitamin B12 levels but with functional deficiency of vitamin B12 and clinical symptoms which improve on therapy.

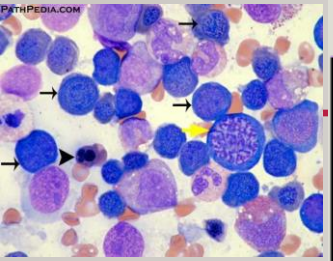
High risk patients for vitamin B12 deficiency

- Vegetarians, vegans
- Drugs: Metformin, Proton pump inhibitors, H2 blockers, Nitrous oxide, Cholestyramine, Neomycin, colchicine.
- Malabsorption syndromes- Coeliac, IBD, atrophic gastritis, post bariatric surgery despite supplementation
- H pylori infection (association)
- Chronic alcohol abuse
- Conditions with increased cell turnover-psoriasis, pregnancy, tumours.
- Patient on folate supplements with untreated vitamin B12 deficiency





Low vitamin B12 ⟶ High MMA ⟶ reduced influx of Succinyl CoA in Kreb cycle
= impaired ATP synthesis



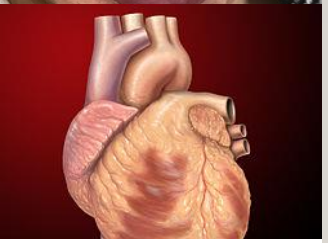
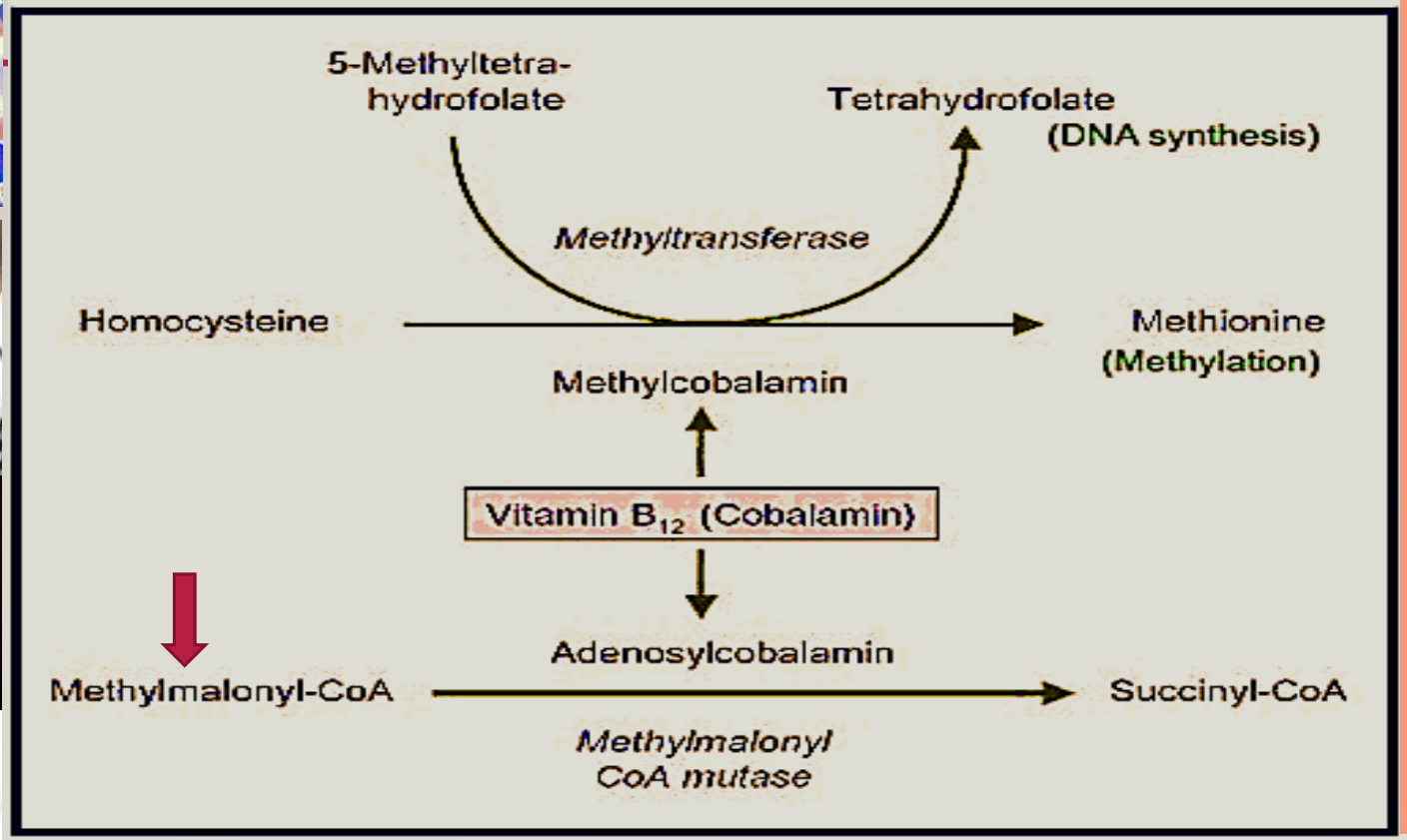
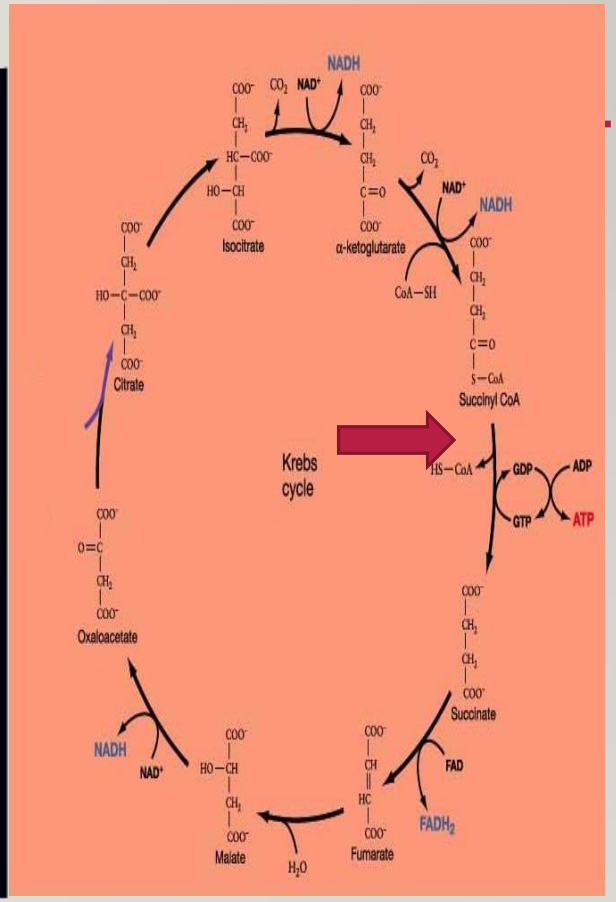
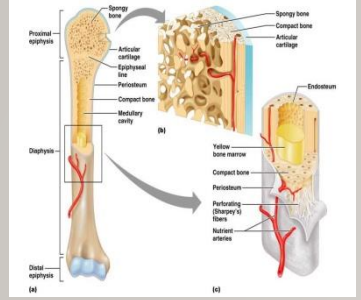


Figure 1: The Biochemical Role of Cobalamin







DIAGNOSIS

- Severe vitamin D deficiency with secondary hyperparathyroidism.
- High bone turnover as suggested by 80% Bone ALP-risk of low impact fractures and poor bone metabolism
- Coexisting iron and vitamin B12 deficiency aggravated dental loss due to periodontitis due to multifactorial reasons*.
- Neurological features due to functional vitamin B12 deficiency.

MANAGEMENT

- Aggressive therapeutic parenteral vitamin D (300,000 IU i.m injection followed by 20,000 IU orally twice per week) and vitamin B12 supplementation (7 1mg i.m injections over two weeks followed by three monthly shots) along with oral iron therapy.

- Bone turnover decreased (bone ALP reduced significantly) with symptomatic relief (bone pains decreased significantly).

- No further tooth loss with improved dental condition.
- Energy levels much better, no pins and needles in the legs and walk more stable.

CASE 2

- 51yr old woman, sleeve gastrectomy (2008) & gastric bypass (2011) elsewhere, poor drug compliance, lost to follow up.
- Inpatient for 16 months in two different hospitals
- Was treated for Wernicke's Encephalopathy with ongoing parenteral thiamine therapy.
- Worsening depression and wheelchair bound X 3 years due to neuropathy involving feet.
- Referred to HUH Bariatric specialist unit.

POSITIVE FINDINGS ON NEUROMUSCULAR EXAMINATION

- Proximal muscle weakness, bilateral spastic paresis
- Proprioception- markedly diminished
- Absent deep tendon reflexes – ankles and patellar tendon
- Positive Babinski reflex
- Unable to stand

Investigations

Blood test	18/02/15	Normal Range
Albumin	21	38-50 g/L
Hb	115	115-165 g/L
MCV	97.2	80-98 fL
Corrected Ca2+	2.63	2.2-2.6 mmol/L
Caeroplasmin	→ 0.09	0.2-0.63 g/L
Iron serum	6	12-28 umol/L
MMA	→ 1.26	0-0.29 umol/L
B12	→ 260	200-1000 ng/L
Folate	>upper detectable limit	4-18 ug/L
Ferritin	322	9-120 ug/l
Holotranscobalamin	36.1	35-70 pmol/L
PTH	3.4	1.3-6.8 pmol/L
T4	11.9	9-19 pmol/L
TSH	1.82	0.3-5 mu/L
25 OH Vit D	113	80-150 nmol/L

Further investigations

Blood test	18/02/15	Normal Range
Selenite broth	36.9	53-105 µg/L
Copper	3.5	12.6-24.3 µmol/L
Zinc	14.5	11-19 µmol/L
Vitamin A	1.92	1.05-3.84 µmol/L
Thiamine	162	50-220 nmol/L

DIAGNOSIS

- **Severe functional* vitamin B12 deficiency with folate overdose ****
- **Severe copper deficiency.**
- **Selenium deficiency**
- **Depleted iron stores****

MANAGEMENT

- **All folate supplements <u>stopped IMMEDIATELY</u>.**
- **Vitamin B12 i.m. injections (therapeutic regimen for neurological complications)**
- **Stopped Thiamine injections .**
- **<u>Copper i.v infusions</u> (multiple with careful monitoring)**
- **High dose oral multivitamins including selenium and iron (with careful ratio of zinc to copper*)**
- **Increased protein intake to achieve optimum albumin levels*.**

CLINICAL OUTCOMES

- **Marked neurological improvement.**
- **Proprioception regained, patient could walk with crutches after 3 years**
- **Borderline personality disorder-diagnosis being reviewed!**
- **One of the most rewarding experiences for the entire bariatric team at HUH, London.**