Guideline

Micronutrient supplementation and monitoring after total and subtotal gastrectomy

Key messages

- Vitamins and minerals are likely to be poorly absorbed after gastrectomy.
- All patients should take a daily multivitamin and mineral tablet.
- After total gastrectomy, all patients should receive 12 weekly vitamin B12 injections.
- It is possible that micronutrient deficiency could develop even with supplementation.
- All patients should be regularly screened for micronutrient deficiencies as outlined below.

Summary

All patients who have undergone total or partial gastrectomy (excluding sleeve gastrectomy) should receive daily oral multivitamin and mineral supplementation and intramuscular vitamin B12 supplementation every 12 weeks. Micronutrient status should be monitored as per the schedule below:

Test	Frequency
U&Es (including magnesium)	Six monthly for two years, then annually
Creatinine	Six monthly for two years, then annually
Liver function tests	Six monthly for two years, then annually
Full blood count	Six monthly for two years, then annually
Ferritin	Six monthly for two years, then annually
B12 (pre-injection)	Annually
Folate	Six monthly for two years, then annually
Calcium	Six monthly for two years, then annually
Vitamin D	Six monthly for two years, then annually
INR	Six monthly for two years, then annually
Vitamin A	Annually
Vitamin E	Annually
Zinc	Annually
Copper	Annually
Selenium	Annually

1 Scope

Departmental – pertinent to oesophago-gastric surgery and gastroenterology.

2 Purpose

To provide guidelines for micronutrient supplementation and monitoring in the gastrectomy population to facilitate prevention and early detection of micronutrient deficiency.

These guidelines are not intended to be used in the bariatric surgery population.

3 Definitions

Gastrectomy – total or subtotal gastrectomy with Roux-en-Y reconstruction or equivalent, **not** sleeve gastrectomy.

4 Introduction

The long-term metabolic and nutritional consequences of gastrectomy are unclear, as there have been no good quality long-term studies. This document is based on guidelines published for the bariatric surgical population, which have been amended to reflect the different nutritional challenges experienced by the gastrectomy population[1-4]. The few long-term studies of micronutrient deficiency after upper gastrointestinal surgery support this approach[5,6].

The clinical presentation of micronutrient deficiency can be subtle, and may include non-specific visual and neurological symptoms. The presence of unexplained non-specific symptoms in the post-gastrectomy patient should instigate prompt biochemical assessment and consideration of referral to a specialist in nutrition or clinical biochemistry.

A comprehensive set of guidance on the management of long-term symptoms in this patient group can be accessed at:
http://fg.bmj.com/content/early/2016/10/14/flgastro-2016-100714 [7]

Within this document, key recommendations are highlighted in bold, above rationale for the guidance in normal script.

This document is intended to guide the hospital team and general practitioner caring for a patient who has undergone total or partial gastrectomy. Within the prophylactic total gastrectomy group, this includes patients undergoing surgery in their 20s, who may manifest micronutrient deficiencies years or decades later.

All patients should have testing as below every six months for the first two years post-surgery, then annually thereafter. Micronutrient deficiencies can still occur many years after the index surgery, although the interval of testing may be extended if the patient has experienced many years of stable results (albeit with a low threshold for a full micronutrient assessment in the presence of any symptoms). Replacement of micronutrient deficiencies in this population can be challenging, and carry its own risks, and consideration should be given to seeking specialist support from local nutrition services and/or the specialist dietitians within the Cambridge Oesophago-Gastric Centre.

It is worth noting that some drug formulations, particularly enteric coated tablets, are poorly absorbed in this population, as there is no reservoir in which the tablets can be dissolved, and intestinal transit is rapid.

All supplements can be purchased over the counter from a pharmacy or supermarket.

5 Responsibilities

This document has been produced with input from the departments of surgery (Mr Geoffrey Roberts, Mr Richard Hardwick), Gastroenterology (Dr Dunecan Massey, Professor Rebecca Fitzgerald), Clinical Biochemistry (Dr Claire Meek, Professor Fiona Gribble) and Dietetics (Miss Nicola Sunderland, Mrs Sam Grimes).

It has been externally peer reviewed by Dr J Andreyev, Consultant Gastroenterologist, The Royal Marsden Hospital.

It has been reviewed by the oesophago-gastric cancer specialist MDT.

6 Guidance

6.1 Routine supplements in the post-gastrectomy patient

All patients after gastrectomy are recommended to receive a daily multivitamin and mineral tablet (including Vitamin B complex), and at least three monthly vitamin B12 intramuscular injection regardless of nutritional state. Simple multivitamin tablets without minerals are insufficient. Over the counter A-Z multivitamin and mineral supplements are normally adequate.

6.2 Persistent malabsorption and diarrhoea

Patients with persisting malabsorption may have another underlying cause and we recommend a low threshold for screening for pancreatic exocrine insufficiency, coeliac disease, bile acid malabsorption and small intestinal bacterial overgrowth in refractory cases of micro or macro-nutrient deficiency.

Steatorrhoea may be underdiagnosed in the post-gastrectomy group, and result in multiple, refractory, vitamin and mineral deficiencies. The primary causes are pancreatic exocrine insufficiency, bile acid malabsorption and small intestinal bacterial overgrowth. We recommend that patients with steatorrhoea be investigated with faecal elastase and hydrogen/ methane breath tests and, if these are negative, a SeHCAT scan.

6.3 General biochemistry

Annual creatinine, urea, electrolytes (including magnesium) and liver function tests should be performed.

Patients are at risk of dehydration and protein energy malnutrition. Unfortunately there is no single biochemical test which can give an indication of global nutritional status. All biochemical measurements need to be interpreted in the light of clinical factors, including the patient's weight, any recent weight change and the presence of any inflammatory or infective processes, which will increase nutritional requirements.

Albumin can be regarded as a (poor) surrogate marker of chronic malnutrition in the absence of acute illness (ie when the C-reactive protein and white cell count are both normal).

6.4 Anaemia

To identify and prevent anaemia, annual testing for Full Blood Count, ferritin, transferrin saturation, B12 (pre-injection) and folate should be performed. All pregnancies in this patient group should be regarded as at higher risk for neural tube defect and the mother should be treated with high dose folate commencing prior to pregnancy.

Absorption of iron, folate and B12 is significantly impaired after gastrectomy[8]. Many patients may have anaemia due to a deficiency of more than one nutrient. Regardless of the mean corpuscular volume, all patients presenting with anaemia should have a full assessment of haematinics, vitamin B12 and folate, with supplementation as indicated. Oral iron replacement should be with chewable or soluble tablets (patient must purchase from outside pharmacy), or syrup, as non-dissolvable forms can pass intact through the entire intestinal tract[9].

The high risk of folate malabsorption after gastrectomy means that all women considering pregnancy should be treated as at risk of a neural tube defect, and treated accordingly with high dose folate[10].

Women should be encouraged to have planned pregnancies with a pre-pregnancy nutritional assessment. It should also be noted that some multivitamin preparations contain high levels of vitamin A and may be inappropriate in the pre-conception and pregnant period.

6.5 Bone density

All patients should have annual testing for calcium and vitamin D.

It is possible that patients are at risk of osteoporosis due to impaired absorption of calcium and vitamin D after gastrectomy. Limited studies indicated the risk may be as high as 71% in the post-menopausal female population[11-16]. This is an area of clinical uncertainty and will benefit from further research.

There is at present insufficient evidence to support routine DXA screening for osteoporosis in this patient group, however this may change in the future. We recommend a low threshold for DXA scanning in this population, and opportunistic screening should be considered in all post-gastrectomy patients over the age of 50 or post-menopause (whichever comes earlier).

6.6 Fat soluble vitamins

All patients should have annual testing for vitamins A, E and D, and an INR check which provides an assessment of the adequacy of vitamin K stores.

The degree and severity of fat malabsorption in patients after a gastrectomy is unclear, although recent literature suggests it is a notable risk and carries the added complication of fat soluble vitamin malabsorption[17].

Patients with deficiencies should be given supplementation and appropriate dietary advice. A low threshold for interval testing should be applied if the patient has steatorrhea or non-specific visual or neurological symptoms.

6.7 Vitamin C

Testing for possible vitamin C deficiency should be performed after consultation with a clinical biochemist.

The incidence of vitamin C deficiency in bariatric surgery patients is up to 34%[18] and vitamin C malabsorption is possible in the post-gastrectomy group. Early diagnosis and treatment of deficiency may prevent clinical manifestations, however accurate measurement is challenging and requires specialist input. Routine testing is not recommended.

6.8 Zinc and copper

All patients should have annual testing for zinc and copper levels and supplementation, if necessary, should be at a ratio of 8-15mg of zinc to 1mg of copper. Supplementation of zinc or copper without the other must be avoided.

Zinc and copper are primarily absorbed in the proximal small intestine, which is partly bypassed after a gastrectomy[19]. Deficiency of either should be considered in the post gastrectomy population. Zinc and copper compete for the same transporter for absorption from the intestine into the blood, and excessive zinc consumption, for example during supplementation, can precipitate copper deficiency. Copper deficiency presents insidiously but can cause neurological abnormalities, gait disturbance and anaemia. Absorption of supplemented zinc and copper may be poor.

6.9 Selenium

All patients should have selenium levels checked annually.

There is no evidence to support routine testing for selenium levels in the absence of chronic diarrhoea or other evidence of malabsorption[20]. However, the absence of long-term data in the gastrectomy cohort limits our recommendations, and unpublished data suggest a not inconsiderable incidence of selenium deficiency in the post-gastrectomy population.

6.10 Thiamine

There is no evidence for routine testing for thiamine levels, however if a patient suffers significant weight loss or has symptoms suggestive of Wernicke/ Korsakoff syndrome they should be promptly admitted to hospital for IV thiamine replacement.

7 Monitoring compliance with and the effectiveness of this document

These are guidelines, representing best available evidence, and are intended to guide both local practice and support GPs following up patients who have undergone gastrectomy. It is envisaged that these guidelines will be circulated to GPs at the point of discharge of patients from routine outpatient follow up, and it will therefore not be possible to formally assess compliance in all patients, given our national catchment area for prophylactic gastrectomy.

For local patients, compliance will be assessed by internal audit on a two-yearly basis, responsibility resting with the oesophago-gastric MDT.

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