

GP Guidance: Management of nutrition following bariatric surgery

Introduction

Patients who are morbidly obese will have struggled with their weight for many years before going forward for bariatric surgery. Whilst bariatric surgery is an aid to weight loss, dietary and behavioural changes are essential for achievement of good outcomes including weight maintenance.

All bariatric procedures affect nutritional intake and some procedures may affect the absorption of macronutrients and / or micronutrients. Patients will be required to stay on lifelong nutritional supplements and have lifelong monitoring of their nutritional status.

Key Recommendations

- **Primary care clinicians should only consider prescribing nutritional supplements if patients are deficient. Patient should be encouraged to purchase supplements over the counter, if there are no deficiencies present.**

Vitamin and mineral supplements recommended following gastric bypass (Roux- en-Y) and sleeve gastrectomy

<p>Multivitamin and mineral supplement should include;</p> <ul style="list-style-type: none"> • iron • selenium • 2 mg copper (minimum) • zinc (ratio of 8-15 mg zinc for each 1 mg copper) <p>Preconception and pregnancy</p>	<p>The following meet these requirements (August 2014):</p> <ul style="list-style-type: none"> • one daily Forceval (soluble and capsule) • “Over The Counter” complete multivitamin and mineral supplement, two daily e.g. Sanatogen A-Z Complete, Superdrug A-Z multivitamins and minerals, Tesco Complete multivitamins and minerals, Lloydspharmacy A-Z multivitamins and minerals <p>Safe to continue with Forceval as vitamin A is in beta carotene form or consider pregnancy multivitamin and mineral e.g. Seven Seas Pregnancy, Pregnacare, Boots Pregnancy Support</p>
<p>Iron 45 to 60 mg daily</p> <p>100 mg daily for menstruating women</p>	<p>200 mg ferrous sulphate, 210 mg ferrous fumarate or 300 mg ferrous gluconate daily</p> <p>200 mg ferrous sulphate or 210 mg ferrous fumarate twice daily</p>
<p>Folic acid</p> <p>Contained within multivitamin and mineral supplement</p> <p>Pregnancy and preconception.</p>	<p>Encourage consumption of folate rich foods</p> <p>If deficient, check compliance with multivitamin and mineral supplement. If compliant, check for vitamin B12 deficiency before recommending additional folic acid supplements. Additional folic acid (prescribed or over the counter) if deficient. Recheck folate levels after 4 months.</p> <p>Additional folic acid (5 mg, but see text) preconception and first 12 weeks of pregnancy</p>
<p>Vitamin B12</p>	<p>Intramuscular injections of 1mg vitamin B12 three monthly</p> <p>N.B. sleeve gastrectomy patients may need less frequent injections</p>

Calcium and Vitamin D	Ensure good oral intake of calcium and vitamin D rich foods Continue with maintenance doses of calcium and vitamin D as identified preoperatively Treat and adjust vitamin D supplementation in line with National Osteoporosis Society Guidelines. Patients are likely to be on at least 800 mg calcium and 20 mcg vitamin D e.g. Adcal D3, Calceos, Cacit D3, however many patients will require additional vitamin D
Fat soluble vitamins A, E and K	Sufficient contained within vitamin and mineral supplement Additional fat soluble vitamins may be needed if patient has steatorrhoea
Zinc and copper	Sufficient contained within multivitamin and mineral supplement If additional zinc is needed, ratio of 8 to 15 mg zinc per 1 mg copper must be maintained
Selenium	Sufficient contained within multivitamin and mineral supplement. If required, additional selenium may be provided by two to three Brazil nuts a day or by over the counter preparations including Selenium ACE, Holland and Barrett Selenium, Boots Selenium with Vitamins A, C and E
Thiamine	Sufficient contained within multivitamin and mineral supplement. If patient experiences prolonged vomiting always prescribe additional thiamine (thiamine 200–300 mg daily, vitamin B co strong 1 or 2 tablets, three times a day) and urgent referral to bariatric centre. Those patients who are symptomatic or where there is clinical suspicion of acute deficiency should be admitted immediately for administration of IV thiamine

Vitamin and minerals supplements recommended following duodenal switch	
Multivitamin and mineral supplement should include; <ul style="list-style-type: none"> iron selenium 2 mg copper (minimum) zinc (ratio of 8-15 mg zinc for each 1 mg copper) 	The following meet these requirements (August 2014): <ul style="list-style-type: none"> one daily Forceval (soluble and capsule) “Over The Counter” complete multivitamin and mineral supplement, two daily e.g. Sanatogen A-Z Complete, Superdrug A-Z multivitamins and minerals, Tesco Complete multivitamins and minerals, Lloydspharmacy A-Z multivitamins and Minerals
Preconception and pregnancy	Safe to continue with Forceval as vitamin A is in beta carotene form or consider pregnancy multivitamin and mineral e.g. Seven Seas Pregnancy,
Iron 45 to 60 mg daily 100 mg daily for menstruating women	200 mg ferrous sulphate, 210 mg ferrous fumarate or 300 mg ferrous gluconate daily 200 mg ferrous sulphate or 210 mg ferrous fumarate twice daily
Folic acid Contained within multivitamin and mineral supplement	Encourage consumption of folate rich foods If deficient, check compliance with multivitamin and mineral supplement. If compliant, check for vitamin B12 deficiency before recommending additional folic acid supplements. Additional folic acid (prescribed or over the counter) if deficient. Recheck folate levels after 4 months.
Preconception and pregnancy.	Additional folic acid (5 mg, but see text) preconception and first 12 weeks of
Vitamin B12	Intramuscular injections of 1mg vitamin B12 three monthly

Calcium and Vitamin D	<p>Ensure good oral intake of calcium and vitamin D rich foods</p> <p>Continue with maintenance doses of calcium and vitamin D as identified preoperatively</p> <p>Treat and adjust vitamin D supplementation in line with National Osteoporosis Society Guidelines. Patients are likely to be on at least 800 mg calcium and 20 mcg vitamin D e.g. Adcal D3, Calceos, Cacit D3, however most patients will require additional vitamin D</p>
Fat soluble vitamins A, E and K Additional fat soluble vitamins are needed	AquADEKs Softgels provide additional high doses of fat soluble vitamins A, D, E and K and other vitamins and minerals. Recommend one to two daily. Alternatively supplement with additional vitamins A, E and K as required
Zinc and copper	Sufficient contained within multivitamin and mineral supplement If additional zinc is needed, ratio of 8 to 15 mg zinc per 1 mg copper must be maintained
Selenium	Sufficient contained within multivitamin and mineral supplement If required, additional selenium may be provided by two to three Brazil nuts a day or by over the counter preparations including Selenium ACE, Holland and Barrett Selenium, Boots Selenium with Vitamins A, C and E
Thiamine	Sufficient contained within multivitamin and mineral supplement If patient experiences prolonged vomiting always prescribe additional thiamine (thiamine 200–300 mg daily, vitamin B co strong 1 or 2 tablets, three times a day) and urgent referral to bariatric centre. Those patients who are symptomatic or where there is clinical suspicion of acute deficiency should be admitted immediately for administration of IV thiamine.

Weight loss procedures and impact on nutrition

The main bariatric surgery procedures are the gastric band, gastric bypass and sleeve gastrectomy with the duodenal switch being less frequent. In the initial stages after surgery, patients are advised to start on a liquid diet, before progressing onto pureed food, soft food and then more normal textured food. At two years, the patient should be able to manage a wide range of textures of foods but may still report difficulties with some. It should not be assumed that all patients are eating a “well balanced” diet. Hopefully many will be however some may have maladaptive eating behaviours resulting in a poor nutritional intake.

Recommended nutritional supplements

As nutrition is compromised with bariatric surgery, it is recommended that patients take nutritional supplements lifelong in addition to having a balanced diet. It is important that compliance with supplements is checked regularly. Table 2 shows the usual recommended nutritional supplements, but it should be noted that patients may have different requirements. Although patients who have a gastric band should be able to eat a nutritionally balanced diet, many will be advised to routinely take a

multivitamin and mineral supplement. The patient's bariatric centre should provide full details of the patient's nutritional requirements and supplements. For further information, please refer to the British Obesity and Metabolic Surgery Society (BOMSS) guidelines (O'Kane *et al* 2014).

Table 1: Impact of surgery on nutrition

Surgical procedure	Impact on nutrition
Gastric band	No impact on absorption. Over tight gastric band affects nutritional quality of diet including protein and iron
Sleeve gastrectomy	May be some impact on absorption including iron and vitamin B12
Gastric bypass	Impacts on absorption of iron, vitamin B12, calcium and vitamin D Long limb bypasses may affect absorption of protein, fat, vitamin A and trace elements in addition
Duodenal switch	Impacts on absorption of protein, fat, calcium, fat soluble vitamins A, D, E and K, zinc

Table 2: Nutritional supplements (routine)

Nutritional supplement	Surgical procedure		
	Sleeve Gastrectomy	Gastric bypass	Duodenal switch
Multivitamin and mineral	Yes	Yes	Yes
Iron	Yes	Yes	Yes
Folate	As part of multivitamin and mineral	As part of multivitamin and mineral	As part of multivitamin and mineral
Vitamin B12	Yes (1)	Yes	Yes (1)
Calcium and vitamin D	Yes	Yes	Yes
Zinc and copper	As part of multivitamin and mineral	As part of multivitamin and mineral	As part of multivitamin and mineral. Additional may be needed
Selenium	As part of multivitamin and mineral	As part of multivitamin and mineral	As part of multivitamin and mineral
Additional fat soluble vitamins	No	No	Yes

(1) May be variation between centres as to whether routine supplementation with vitamin B12 following the sleeve gastrectomy or duodenal switch.

Blood tests following surgery

Continued nutritional monitoring is essential following bariatric surgery to ensure that patients do not develop nutritional problems in the longer term. It must be not assumed however that abnormal blood results are always directly related to the surgery itself. Table 3 shows the recommended blood tests which should be done annually as a minimum for the sleeve gastrectomy, gastric bypass and duodenal switch. Following the gastric band, if there is any suspicion that the patient is not adhering to a nutritionally balanced diet, appropriate blood tests should be done.

Table 3: Annual blood tests following bariatric surgery

Blood tests	Surgical procedure		
	Sleeve Gastrectomy	Gastric bypass	Duodenal switch
Liver function tests	Yes	Yes	Yes
Full Blood Count	Yes	Yes	Yes
Ferritin	Yes	Yes	Yes
Folate	Yes	Yes	Yes
Vitamin B12	Yes (1)	Yes (1)	Yes (1)
Calcium	Yes	Yes	Yes
Vitamin D	Yes	Yes	Yes
Parathyroid hormone	Yes	Yes	Yes
Vitamin A	No	Possibly (2)	Yes
Zinc, copper	Possibly (3)	Yes (3)	Yes (3)
Selenium	No (3, 4)	No (3, 4)	No (3, 4)

- (1) If patient is having three monthly intramuscular injections of vitamin B12, there may be no need for annual checks
- (2) If the patient has a long limbed bypass, symptoms of steatorrhoea or night blindness
- (3) Measure when concerns for example, if screening for iron deficiency anaemia is negative, hair loss, pica, neutropenia
- (4) Measure when concerns for example, cardiomyopathy, chronic diarrhoea

Nutritional deficiencies – what to look for

Protein malnutrition / protein energy malnutrition

Protein malnutrition can occur for a number of reasons including poor dietary choice, an over tight gastric band, anastomotic stricture or protein malabsorption. It may present several years following surgery. Protein energy malnutrition is accompanied by oedema. In all cases of suspected protein malnutrition the patient must be fast tracked back to the bariatric centre.

Anaemia

Iron deficiency anaemia

Whilst iron deficiency anaemia is relatively common following the gastric bypass, it must not be assumed that this is the only cause. Other causes should also be considered and investigated if appropriate.

If additional oral iron does not correct the iron deficiency anaemia, parenteral iron or blood transfusions may be necessary. Ensure that the patient maintains levels with oral iron supplements. These should be taken with meals or drinks containing vitamin C to aid absorption and at a different time to calcium supplements.

If the anaemia is not due to iron deficiency or blood loss, other nutritional causes should be considered. These include folate, vitamin B12, zinc, copper and selenium.

Folate and vitamin B12

Low folate levels may be an indication of noncompliance with multivitamin and mineral supplements. However, it could also be an indication of severe malabsorption especially if there are other nutritional deficiencies. Megaloblastic anaemia is caused by folate deficiency or vitamin B12 deficiency. Vitamin B12 deficiency, if untreated, results in irreversible peripheral neuropathy. Therefore it is essential that vitamin B12 deficiency is considered before recommending additional folic acid. Those patients who are vitamin B12 deficient should have levels corrected with intramuscular injections of vitamin B12. Once corrected, three monthly injections of 1mg vitamin B12 will maintain levels.

Calcium, vitamin D and parathyroid hormone levels

Vitamin D deficiency may result in secondary hyperparathyroidism to maintain calcium levels. Clear recommendations for the management of vitamin D deficiency are given in the National Osteoporosis guidelines: Vitamin D and Bone Health: A practical clinical guideline for patient management (Francis *et al* 2013).

Vitamin A

Patients who have steatorrhoea or who have had a duodenal switch may be at risk of vitamin A deficiency. Certainly, duodenal switch patients should be on extra fat soluble vitamins. Despite this, vitamin A levels may drop over time. Changes in night

vision may be an indication of vitamin A deficiency. If the patient has vitamin A deficiency, oral supplementation with vitamin A is needed.

Zinc, copper and selenium

Unexplained anaemia, poor wound healing, hair loss, neutropaenia, peripheral neuropathy or cardiomyopathy may be symptoms of zinc, copper or selenium deficiency and so levels should be checked if there are any concerns. Zinc and copper share a common pathway so supplementation with zinc can induce copper deficiency and vice versa. Information about any additional over the counter supplements the patient may be taking is essential. If additional zinc supplementation is required, a ratio of 1 mg copper for every 8 to 15 mg zinc must be maintained.

Steatorrhoea

Patients who have had a duodenal switch or long limbed gastric bypass are at the greatest risk of malabsorption and steatorrhoea. Consequently these patients may develop protein malnutrition and become deficient in fat soluble vitamins and zinc, if there are any concerns regarding the nutritional status of these patients.

When to request specialist biochemical / nutritional advice or to refer your patient:

Diagnosis and management of micronutrient deficiency syndrome can be complex and so when in doubt it is recommended that specialist advice is sought. The following are examples of situations where this is appropriate.

1. Newly identified biochemical deficiency, where there is differential diagnosis (there can be causes other than previous bariatric surgery) or its appropriate investigation and treatment are uncertain.
2. Unexplained symptoms that may be indicative of underlying micronutrient / trace element deficiencies.
3. Women who have undergone previous gastric bypass, sleeve gastrectomy or duodenal switch surgery and who are planning to become pregnant or who are pregnant.

Further information

[Guidelines on perioperative and postoperative biochemical monitoring and micronutrient replacement for patients undergoing bariatric surgery](#)

[BOMSS GP Guidance: Management of nutrition following bariatric surgery](#)

References & Acknowledgements

British Obesity & Metabolic Surgery Society

BOMSS Guidelines on peri-operative and postoperative biochemical monitoring and micronutrient replacement for patients undergoing bariatric surgery

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