The Use of Nutritional Support in Surgery

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Surgery causes a large inflammatory response in the short-term, consequently impacting the mobilisation of nutrients, whilst the surgery itself can cause long-term impacts on the absorption of nutrients. The importance of nutrition support prior to surgery and in the immediate recovery period will be explored within this article.

Bariatric surgery, as a treatment for type 2 diabetes and/or obesity, requires surgical candidates to subscribe to a lifelong commitment to micronutrient supplementation and monitoring. Surgery as a cancer treatment, on the upper gastrointestinal tract and pancreas, has a similar chronic impact on the processing of many micronutrients, as explored earlier in this series.[1] Gastrointestinal surgery for inflammatory bowel disease, requiring bowel resection or enterocutaneous fistula, can have consequences on short- and long-term nutritional status.

In the current COVID-19 pandemic, access to surgery and long-term nutritional support, such as vitamin B12 injections,[2] may be impacted and novel approaches may be required to ensure this cohort is managed as safely as possible.

Pre-operative nutrition support

Either when surgery is being planned, or on admission to hospital, nutritional risk screening should occur to identify those who may require additional nutrition support.[3] In the UK, the Advisory Committee on Borderline Substances (ACBS) states that 'Pre-operative preparation of undernourished patients' is an indication for the prescription of oral nutritional supplementation,[4] and may be required in patients who need to ameliorate their nutritional status before surgery. The British Association of Parenteral and Enteral Nutrition (BAPEN) recommend the consideration of micronutrient supplementation before surgery in 'well nourished' patients.[5] In undernourished patients, there should be individual dietetic assessment, including the correction of macronutrient and micronutrient deficiencies, and for patients undergoing major elective surgery where intestinal failure is not an issue, enteral supplementation is advised.[5]

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Before surgery many patients may have anaemia, particularly those undergoing colorectal surgery where there may be blood loss or chronic inflammation due to the underlying condition. It is recommended that anaemia is investigated and treated to correct levels before surgery.[6] In the past, long periods of fasting (i.e. over 12 hours) before surgery were thought to be required to reduce the risk of aspiration. If surgery became delayed, the periods of fasting could compromise nutritional status. In modern times, extensive fasting is no longer advocated, with the European Society for Clinical Nutrition and Metabolism (ESPEN) strongly recommending that solid food should be permitted until 6 hours before surgery and clear fluids up to 2 hours before.[3]

For surgery performed on a regular basis, such as colorectal surgery, Enhanced Recovery After Surgery (ERAS) protocols exist, which reduce the clinical complications of surgery and length of stay, as well as being more cost-effective to healthcare.[6, 7] ERAS protocols include many aspects, such as anaesthesia, skin preparation and mobilisation post-surgery, but largely focus on managing the metabolic impact of surgery. This includes the preoperative loading of carbohydrate prior to colorectal surgery.[6] Carbohydrate loading may reduce postoperative insulin resistance and help maintain lean body mass and muscle strength; however, the data around reducing length of stay specifically linked to carbohydrate pre-loading requires further evidence.[6]

Following surgery, a prompt reintroduction of nutrition is indicated, with the oral route being preferred where possible.[3] Early introduction of nutrition is demonstrated in multiple studies to improve wound healing after surgery and the overall recovery.[6] This includes oral or enteral nutritional supplementation both in those who were pre-operatively screened to be at risk of malnutrition, and those who were not identified as having a suboptimal nutritional status pre-surgery.[3] ESPEN suggests enteral supplementation may be required in those unable to meet greater than 50% of their nutritional requirements following their operation.[3] Supplementation may be helpful to meet any deficit in energy and protein requirements, in addition to supporting micronutrient levels.[6]

Bariatric surgery

Bariatric surgery encompasses several surgical procedures (the most commonly performed in the UK being adjustable gastric band, sleeve gastrectomy, Roux-en-Y gastric bypass and biliopancreatic diversion/duodenal switch), which are clinically effective treatments for obesity and, in some cases, act as a treatment for type 2 diabetes.[8] In 2014, the National Institute for Health and Care Excellence (NICE) updated their guidance for bariatric surgery, which included the recommendation to expedite surgery for those with a body mass index (BMI) greater than 35 kg/m^2 who had been diagnosed with type 2 diabetes in the last year.[8]

Prior to bariatric surgery, patients are likely to already have low levels of vitamins and minerals.[9] All bariatric surgery procedures impact micronutrient status, with the potential to cause overt deficiencies, and NICE recommend that patients are 'offered at least annual monitoring of nutritional status and appropriate supplementation according to need' following surgery.[8]

In August 2020, the British Obesity and Metabolic Surgery Society (BOMSS) updated their earlier 2014 guidelines on pre- and post-operative monitoring and post-operative micronutrient supplementation.[9] Prior to surgery, individual dietetic assessment is advised, with full haematinics (full blood count, including haemoglobin, ferritin, folate and vitamin B12, calcium, vitamin D) and the associated parathyroid hormone should be checked. Where there are clinical concerns, vitamin A, zinc, copper and selenium may also require biochemical testing. It is recommended that where deficiencies are identified, they are corrected before surgery.[9]

For all bariatric surgical procedures, a multivitamin and mineral, which includes thiamine, iron, copper, zinc, selenium, 400-800 micrograms of folic acid and the UK government dietary recommendation for vitamin A, is recommended to be taken daily.[9]

BOMSS summarise from the current evidence that there is not a known optimal intake for calcium.[9] Dietary intake of calcium should be encouraged, however, particularly with malabsorptive surgeries, supplementation of calcium and vitamin D may be required. Vitamin D supplementation should be adjusted to achieve optimal serum vitamin D levels (i.e. greater than 75 nmol/L).[9]

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Following a sleeve gastrectomy, Roux-en-Y gastric bypass, or malabsorptive procedures such as duodenal switch, BOMSS recommend routine supplementation with vitamin B12 intramuscular injections every three months.[9] During the height of the COVID-19 pandemic, interim advice was issued to consider oral vitamin B12 but, if pressures on services and/or self-isolation prohibit access to B12 injections,[2] this may need to be considered further if a resurgence of COVID-19 cases are seen in the UK.

Following adjustable gastric band placement, a multivitamin and mineral supplement containing iron is recommended, whilst additional elemental iron supplementation is recommended with other common surgeries and for menstruating women.[9]

The BOMSS guidance also includes more bespoke advice for individual surgeries, particularly malabsorptive surgeries, with a focus on fat soluble vitamins, managing deficiencies that don't respond to initial treatment (e.g. vitamin D), and pregnancy.[9]

The key to preventing long-term complications of bariatric surgery linked to micronutrient deficiencies, is to monitor and adjust treatment accordingly. NICE recommend that patients should be followed up for at least two years within a bariatric service, which includes monitoring of micronutrient status, and that on discharge from the specialist bariatric service there should be at least annual monitoring (i.e. within the primary care setting led by the GP).[8] At the time of writing, BOMSS have encouraged bariatric surgery services, which have been suspended due to the pandemic, to restart at the earliest opportunity.[10] BOMSS have also suggested that blood tests may need to occur in primary care for recent post-operative monitoring and that self-administered finger prick testing kits may need to be considered.[10]

Long-term adherence to micronutrient supplementation is needed to prevent complications, including pressure ulcers, neurological conditions (linked particularly to vitamin B12 and thiamine deficiencies), osteopenia and osteoporosis. In 2012, a coroner determined that the death of a woman following gastric bypass could be attributed to micronutrient deficiencies which led to pressure ulcers, infection and death.[11] This woman had been lost to follow up from bariatric services. At the time, the National Patient Safety Agency issued an alert highlighting the need for both life-long follow up and monitoring of micronutrient status and for appropriate supplementation to be taken lifelong to prevent future tragedies.[11] The cost of vitamin and mineral supplementation has been cited as a barrier to compliance,[12] therefore some may benefit from the prescription of routine and corrective doses of vitamins and minerals to aid this. However, the BOMSS highlight concerns that some areas of the UK do not permit access to prescriptions for vitamin and mineral supplements.[9]

Gastrointestinal surgery

Enterocutaneous fistula

An enterocutaneous fistula is an abnormal connection that develops between the intestinal tract, or stomach, and the skin. This can occur most commonly due to inflammatory bowel disease, malignancy or as a surgical complication.[13] Initially, enteral or parenteral nutrition support may be required, especially with high output stomas, and an increase in protein.[13] There is an increased vitamin C requirement of 5-10 times over the standard needs.[13] While vitamin and mineral needs must be fully met with a low output stoma, when there is a high output at least double the normal requirements of vitamin and minerals, such as selenium, zinc and copper, are required.[13] This scenario may therefore need additional vitamin and mineral supplementation over that provided by enteral feeding products.

Bowel resection

As previously mentioned, preoperative optimisation of nutritional status can improve surgical outcomes. Where bowel resection is planned on an elective basis for Crohn's disease, exclusive enteral nutrition for four weeks prior to surgery has been demonstrated to reduce incidence of infective and non-infective surgical complications.[14] Anaemia, which inflammatory bowel disease predisposes the individual to, is linked to worse surgical outcomes, including complications and increased length of stay.[15] In practice, biochemical assessment and correction of micronutrient deficiencies before surgery, in particular for patients with anaemia, may therefore improve surgical outcomes. The long-term nutritional impact and need for nutritional support following bowel resection will vary according to the type of surgery and the remaining length of bowel post-surgery, as well as the individual adaptation to the resection. Patients requiring an ileostomy are at risk of sodium, magnesium and calcium deficiencies.[16] When more than 60-100 cm of terminal ileum has been resected, vitamin B12 and fat malabsorption occurs.[17] Long-term vitamin B12 treatment is indicated and selenium deficiency and fat-soluble vitamin deficiencies can also occur.[17] Since extensive surgeries can lead to short bowel syndrome, for which parenteral nutrition may be required, the nutritional management is extensive and warrants specialist multi-disciplinary management in a tertiary care setting.

Summary

Increasingly, pre-operative nutritional assessment is being used to pro-actively manage nutritional complications and holistic surgical outcomes. Early assessment allows nutritional support, whether for macro and/or micro nutrients, to be provided where appropriate to optimise nutritional status before surgery. Early introduction of nutrition support following surgery is crucial to facilitate a safe and prompt recovery. Bariatric surgery and gastrointestinal surgery require extensive nutrition support in the immediate post-surgical phase. Ongoing lifelong monitoring and adjustment of nutrition support, aligned to the impact that the surgery has had on a patient's oral intake, and absorption of nutrients is needed.

References: **1.** McManamon R (2020). Nutrition Support in Cancer Treatment. CN; 20(2): 22-24 **2.** BOMSS, RCGP, BDA (2020). COVID-19 and Vitamin B12. Accessed online: www.bomss.org.uk/wp-content/uploads/2020/04/BOMSS-COVID-19-and-vitamin-B12.pdf (Sep 2020). **3.** Weimann A, et al. (2017) ESPEN Guideline: Clinical Nutrition in Surgery. Clin Nutr.; 36: 623-650. **4.** BAPEN (2016). Oral Nutritional Supplements. Accessed online: www.bapen.org.uk/nutrition-support/nutrition-by-mouth/oral-nutritional-supplements (Sep 2020). **5.** BAPEN (2012). Perioperative Nutrition: Decision Tree. Accessed online: www.bapen.org.uk/pdfs/decision-trees/perioperative-nutrition.pdf (Sep 2020). **6.** Gustafsson UO, et al. (2019) Guidelines for Perioperative Care in Elective Colorectal Surgery: Enhanced Recovery After Surgery (ERAS®) Society Recommendations: 2018. World J Surg.; 43: 659-695. **7.** Rinnella E, et al. (2018). NutriCatt protocol in the Enhanced Recovery After Surgery (ERAS) program for colorectal surgery: The nutritional support improves clinical and cost-effectiveness outcomes. Nutrition 50: 74-81 **8.** NICE (2014). Obesity: identification, assessment and management. Clinical guideline [CG189]. Accessed online: www.nice.org.uk/guidance/cg189/chapter/1-recommendations#surgical-interventions (Sep 2020). **9.** O'Kane M, et al. (2020). British Obesity and Metabolic Surgery Society Guidelines on perioperative and postoperative biochemical monitoring and micronutrient replacement for patients undergoing bariatric surgery - 2020 update. Obes Rev.; doi: 10.1111/obr.13087. Accessed online: https://onlinelibrary.wiley.com/doi/full/10.1111/obr.13087 (Sep 2020). **10.** BOMSS (2020). BOMSS-Restarting-Bariatric-Surgery-in-the-COVID-Era-Guidelines. Accessed online: www.bomss.org.uk/wp-content/uploads/2020/06/BOMSS-Restarting-Bariatric-Surgery-in-the-COVID-Era-Guidelines_May-2020.pdf (Sep 2020). **11.** McManamon R (2018). The Use of Complete Vitamin and Mineral Supplementation in Chronic Health Conditions CN; 18(2): 32-24. **12.** Schiavo L, et al. (2016). Patient adherence in following a prescribed diet and micronutrient supplements after laparoscopic sleeve gastrectomy: our experience during 1 year of follow-up. J Hum Nutr Diet.; 30(1): 98-104. **13.** Gribovskaja-Rupp I, Melton GB (2016). Enterocutaneous Fistula: Proven Strategies and Updates. Clin Colon Rectal Surg.; 29(2): 130-137. **14.** Wang H, et al. (2016). Impact of Preoperative Exclusive Enteral Nutrition on Postoperative Complications and Recurrence After Bowel Resection in Patients with Active Crohn's Disease. World J Surg 40, 1993-2000 **15.** Michailidou M, Nfonsam VN (2017). Preoperative anemia and outcomes in patients undergoing surgery for inflammatory bowel disease. The American Journal of Surgery 215, 1 78-81 **16.** Ng DHL, et al. (2013). The 'not so short-bowel syndrome': potential health problems in patients with an ileostomy. Colorectal Diseases 15(9):1154-61. Colorectal Dis.; 15(9): 1154-1161. **17.** Nightingale J, Woodward JM; Small Bowel and Nutrition Committee of the British Society of Gastroenterology. (2006). Guidelines for management of patients with a short bowel. Gut.; 55(Suppl 4): iv1-iv12.

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