



### Online learning opportunity

See page 141 for details.

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### Article points

1. The aims of bariatric surgery are to reduce weight, reduce medical problems and prevent onset of weight-related medical conditions.
2. As the prevalence of obesity increases, so too could the prevalence of bariatric procedures for weight loss.
3. Key aspects to consider as part of post-bariatric care include dumping syndrome, nutritional deficiencies, excess skin and metabolic bone disease.
4. Special considerations are needed for pregnancy care, diabetes remission and avoiding weight regain.

### Key words

- Bariatric surgery
- Dumping syndrome
- Nutritional deficiency

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# Complications and considerations after bariatric surgery

Chinnadorai Rajeswaran

**Weight loss surgery, also known as bariatric surgery, refers to surgical interventions designed to reduce weight. Procedures can restrict food intake, reduce the amount of food absorbed or both. This article will cover some of the aspects of post-bariatric care, including complications such as dumping syndrome and nutritional deficiencies. Considerations such as pregnancy care and weight regain in the years following surgery will also be discussed.**

In the UK, the incidence of obesity and associated comorbidities continues to increase (Health and Social Care Information Centre, 2014). Recent studies have shown that intensive medical therapy with bariatric surgery is a more effective way at regaining glycaemic control, reducing weight and then sustaining weight loss than intensive medical therapy alone (Schauer et al, 2014).

The aims of bariatric surgery are to reduce weight, reduce medical problems and prevent onset of weight-related medical conditions. Procedures can be temporary or permanent and can work by either restricting food intake, reducing the amount of food absorbed, or a mixture of both. The most common bariatric surgery procedures performed in the UK include gastric banding, Roux-en-Y bypass (gastric bypass), sleeve gastrectomy and biliopancreatic diversion ([BPD] with or without duodenal switch). These procedures are usually performed laparoscopically. There are weight loss interventions that can be completed less invasively; for example, intragastric balloon procedures are carried out endoscopically. The intragastric balloon is a temporary procedure that is often used before bariatric surgery to “kickstart” weight loss. It is not usually funded by the NHS, except in extreme conditions.

Most studies have indicated that gastric bypass and sleeve gastrectomy are more effective at achieving weight loss than gastric banding (Tice et al, 2008; Farrell et al, 2009). However, although not consistently reported, a resolution of obesity-related comorbidities can be achieved with most bariatric procedures. The three most common procedures

have acceptable efficacy and safety, with gastric banding seeming to be a safer procedure with frequent, but less severe, long-term complications (Franco et al, 2011).

Patient criteria for bariatric surgery varies between hospitals, public and private hospitals and countries. In the UK, NICE (2014) recommends that bariatric surgery should be considered if:

- An individual has a BMI of 40 kg/m<sup>2</sup> or more, or between 35 kg/m<sup>2</sup> and 40 kg/m<sup>2</sup> and other significant diseases (for example, type 2 diabetes or high blood pressure) that could be improved by weight loss.
- All appropriate non-surgical measures have been tried but the person has not achieved or maintained adequate, clinically beneficial weight loss.
- The person has tried to lose weight by making lifestyle changes for at least 6 months, but they have not lost any weight.
- The person has been receiving or will receive intensive management in a tier 3 service.
- The person is generally fit for anaesthesia and surgery.
- The person commits to the need for long-term follow-up.
- Other treatment options have failed among people with a BMI of over 50 kg/m<sup>2</sup>.

Bariatric surgery is not always suitable even if the above criteria are met in the following situations:

- Life-threatening illnesses, which includes terminal cancers, liver failure and heart failure.
- Untreated eating disorders.

- Untreated or severe psychiatric illness.
- Genetic conditions that are linked to increased weight. However, studies have suggested that bariatric surgery is a viable option for people with Prader-Willi syndrome (Alqahtani et al, 2015).

### Preoperative care

Once bariatric surgery is deemed appropriate by the multidisciplinary team with experience in preoperative care, counselling and management (Mechanick et al, 2008), surgery can be commenced. As part of the preoperative care, blood tests should be carried out, and any nutritional deficiencies identified at this time should be addressed (Heber et al, 2010). *Box 1* provides a summary of the essential blood tests that should be performed prior to bariatric surgery. Additional tests (e.g. pregnancy or thyroid function tests) may be required according to individual needs (O’Kane et al, 2014).

### Complications following bariatric surgery

Complications following bariatric surgery are rare, and even more so when procedures are conducted laparoscopically as apposed to open procedures. Obesity and its comorbid conditions increase the risk of complications while anaesthesia is also more difficult in this group of people (Schumann, 2013). Peri-operative mortality is less than 0.3% for bariatric surgery, and this is declining with increasing experience of surgeons and their multidisciplinary team (Kim and Wolfe, 2012). The incidence of complications also varies with the frequency of follow up and the level of engagement of patients with the multidisciplinary team. *Box 2* lists some of the complications that can occur following bariatric surgery, with some described in more detail below.

### Dumping syndrome

Dumping syndrome is a debilitating complication of gastrointestinal and vasomotor symptoms that present postprandially due to rapid gastric emptying (Berg and McCallum, 2015). One cause of dumping syndrome is gastric surgery, and among adults, gastric bypass surgery is the most common cause, with the incidence of dumping syndrome as high as 75% (Abell and Minocha, 2006). Dumping syndrome after a sleeve gastrectomy is less frequent

#### Box 2. Complications following bariatric surgery (adapted from Lubert et al [2008]).

##### Early (usually diagnosed <10 days post-surgery)

- Bleeding
- Abdominal pain
- Dysphagia and vomiting
- Anaesthetic complications
- Leakage from staple lines
- Thromboembolism
- Infection – wound infection or port site infection following gastric band surgery
- Bleeding
- Constipation
- Prolonged vomiting
- Excessive weight loss
- Hypotension following excessive weight loss
- Hypoglycaemia

##### Late (usually diagnosed >10 days post-surgery)

- Gastro-oesophageal reflux
- Gall stones
- Kidney stones
- Ulcers at anastomotic sites
- Anastomotic strictures
- Intestinal adhesions/obstructions
- Internal hernias
- Dumping syndrome
- Diarrhoea
- Band erosion or slippage after gastric band surgery
- Nutritional, electrolyte and mineral deficiencies

(Berg and McCallum, 2015).

Following gastric bypass, dumping syndrome develops after high-sugar and high-fat foods are eaten but remain undigested due to the artificially made smaller stomach. This leads to an osmotic overload once delivered to the small intestine. Fluid is drawn into the intestinal lumen by osmosis stimulating a vagal reaction (Fujioka, 2005), which leads to symptoms of abdominal pain, sweating, nausea, diarrhoea, flushing, tachycardia and syncope (Heber et al, 2010). Changes to diet such as having smaller and more frequent meals, separating “dry” and “wet” foods (as liquids speed gastric emptying) and eating fibre and complex carbohydrates can alleviate some of the symptoms. For a medicinal

#### Box 1. Recommended preoperative blood tests before undergoing bariatric surgery.

Full blood count  
Urea and electrolytes  
Liver function tests  
Ferritin  
Folate  
Vitamin B12  
Parathyroid hormone  
Calcium  
Vitamin D  
Fasting blood glucose  
HbA<sub>1c</sub>  
Lipid profile

(Al-Momani et al, 2015)

**Page points**

1. All types of bariatric surgery lead to very reduced total calorie intake; therefore, people who have undergone bariatric surgery are prone to developing some degree of nutritional deficiency.
2. Metabolic bone disease develops in some patients following bariatric surgery, due to reduced absorption of calcium and vitamin D from the duodenum and proximal jejunum.

treatment, acarbose can be prescribed in late dumping syndrome (symptoms appear 1–3 hours postprandially) because it interferes with the digestion of polysaccharides to monosaccharide (De Cunto et al, 2011). Octreotide alleviates both early (symptoms appear within 30 minutes postprandial) and late dumping syndrome symptoms through inhibition of the hormones that encourage digestion (Didden et al, 2006).

**Nutritional deficiencies**

All types of bariatric surgery lead to very reduced total calorie intake, especially in the first 6 months after surgery; therefore, it is common that people who have undergone bariatric surgery will develop some degree of nutritional deficiency. It is necessary to screen patients on a regular basis for nutritional deficiencies and personalise supplementation to avoid deficiencies and complications (see *Table 1*). Best practice guidelines recommend lifelong daily multivitamin and calcium supplementation with added vitamin D (Heber et al, 2010). Investigations for people who have bariatric surgery will depend on the type of surgery and symptoms experienced by patients (*Table 2*). Deficiencies are less common in patients who have undergone gastric balloon and gastric banding compared with malabsorptive procedures like gastric bypass and biliopancreatic diversion (Xanthakosa and Thomas, 2006; Gracia et al, 2007).

**Metabolic bone disease**

Metabolic bone disease (MBD) develops in some patients following bariatric surgery, due to reduced absorption of calcium and vitamin D from the duodenum and proximal jejunum (Sanghera et al, 2012). It was believed that MBD was more common in malabsorptive procedures; however, exclusively restrictive procedures have been shown to put patients at risk of MBD (Pugnale et al, 2003).

Weight loss of 10% for an obese or overweight person, whether it is achieved by bariatric surgery or not, can accelerate bone loss and result in approximately 1–2% bone loss (Williams, 2011).

Deficiency of calcium and vitamin D as a result of bariatric surgery results in an elevation of parathyroid hormone (PTH), also known as secondary hyperparathyroidism (excessive

**Table 1. Symptoms of nutritional, electrolyte and mineral deficiencies (Xanthakos, 2009).**

Nutrients	Symptoms of deficiency
Iron	Microcytic anaemia
Zinc	Acrodermatitis enteropathica-like rash, taste alterations
Copper	Anaemia, neuropathy
Selenium	Cardiomyopathy
Phosphate	Hypophosphataemia is usually due to vitamin D deficiency
Protein	Oedema, poor wound healing
Vitamin A	Reduced night vision, visual impairment
Vitamin B <sub>1</sub>	Wernicke encephalopathy, ataxia, ophthalmoplegia, peripheral neuropathy
Vitamin B <sub>12</sub>	Peripheral neuropathy
Vitamin D	Osteomalacia, parathyroid hormone secondary hyperparathyroidism
Vitamin E	Ataxia, neuropathy
Vitamin K	Abnormal clotting, easy bruising
Folate	Anaemia, neuropathy

secretion of PTH by the parathyroid glands in response to low blood calcium levels). Increased PTH increases bone turnover and bone resorption. Patients with MBD can present with bone and joint pain, muscle weakness and, occasionally, bone fractures (Sanghera et al, 2012).

Therefore, all patients who have received bariatric surgery should undergo routine screening for MBD. Monitoring includes measuring calcium, PTH and vitamin D levels every 6 months for the first 2 years and annually thereafter. To quantify bone mineral density, dual-energy X-ray absorptiometry (DEXA) scanning is recommended every 2 years until bone mineral density is stable (Heber et al, 2010). The management and avoidance of MBD involves vitamin D and calcium supplements, and bariatric individuals should also be encouraged to increase weight bearing activity (Aills et al, 2008). If osteoporosis is found on a DEXA scan parenteral bisphosphonates may be considered, only after appropriate therapy for calcium and vitamin D insufficiency, as oral preparations are not well absorbed in people who have had malabsorptive procedures (Mechanick et al, 2013).

Table 2. Recommended schedules of blood monitoring after different bariatric procedures.

Blood test	Procedure			
	Gastric balloon	Laparoscopic adjustable gastric band	Laparoscopic sleeve gastrectomy	RYGB and BPD (with or without DS)
U&E, FBC, LFTs	If appropriate	Annually (or more frequently if there is concern about nutritional intake)	3, 6, 12 months after surgery, then annually	3, 6, 12 months after surgery, then annually
HbA <sub>1c</sub>	If appropriate (i.e. someone with preoperative diabetes)	Annually	3, 6, 12 months after surgery, then annually	3, 6, 12 months after surgery, then annually
Lipid profile	If appropriate (i.e. someone with preoperative dyslipidaemia)	Annually	3, 6, 12 months after surgery, then annually	3, 6, 12 months after surgery, then annually
Zinc	N/A	N/A	Annually	Annually
Selenium	N/A	N/A	If clinically indicated	If clinically indicated
Ferritin and folate	If appropriate	If appropriate	3, 6, 12 months after surgery, then annually	3, 6, 12 months after surgery, then annually
Calcium	N/A	N/A	3, 6, 12 months after surgery, then annually	3, 6, 12 months after surgery, then annually
Vitamin D	N/A	If clinically indicated	3, 6, 12 months after surgery, then annually	3, 6, 12 months after surgery, then annually
Parathyroid hormone	N/A	N/A	3, 6, 12 months after surgery, then annually	3, 6, 12 months after surgery, then annually
Vitamin A	N/A	N/A	If clinically indicated	Annually in BPD-DS. If appropriate in RYGB
Vitamin E and K	N/A	N/A	If clinically indicated	If clinically indicated
Copper	N/A	N/A	If clinically indicated	Annually
Vitamin B <sub>12</sub>	N/A	N/A	6, 12 months after surgery, then annually	6, 12 months after surgery, then annually

BPD=biliopancreatic diversion; DS=duodenal switch; FBC=full blood count; LFT=liver function tests; RYGB=Roux-en-Y gastric bypass; U&E=urea and electrolytes.

N/A: These blood tests are not required for this procedure.

### Weight regain after bariatric surgery

Weight regain is a fairly common occurrence after bariatric surgery, and it can be expected that 20–25% of the lost weight will be regained over a period of 10 years (Heber et al, 2010). In the author's experience, weight regain is more often seen following gastric banding surgery and occasionally with gastric bypass and biliopancreatic diversion. The causes of weight regain include the following:

- Non-compliance with dietary and lifestyle restrictions.

- Non-attendance at follow-up clinic.

- Insulin use.

- Surgical failure.

- Physiological factors (Heber et al, 2010).

Interestingly, food records show that calorie intake is reduced after bariatric surgery, but increases at 1–2 years after surgery coincide with weight regain (Sjöström et al, 2004). As bariatric patients can begin to disengage with the post-bariatric care and become non-compliant, it is imperative that the multidisciplinary team are aware of the factors that might contribute to weight regain, and that

### Page points

1. An unwelcome outcome of bariatric surgery can be excess, redundant skin as a result of rapid massive weight loss.
2. Women who have had bariatric surgery are often advised to avoid pregnancy for the first 12 to 18 months after surgery. If a woman decides to become pregnant, their nutritional supplementation will need to be adjusted.
3. Diabetes remission is more likely to be encountered if the duration of diabetes is less than 10 years and patients are not on insulin prior to surgery.

patients are educated during their follow-up period and assessed for any of these factors. Patients should also be given realistic preoperative expectations of the results of the bariatric surgery.

### Excess, redundant skin

An unwelcome outcome of bariatric surgery can be excess, redundant skin as a result of rapid massive weight loss. Excess skin confers an increased risk of medical problems, such as fungal infections and eczema, and also psychosomatic problems such as depression (Song et al, 2006) and body dissatisfaction (Mitchell et al, 2008). Patients may feel unattractive and embarrassed by their appearance (Staalesen et al, 2013; Björserud et al, 2015).

Body-contouring surgery is an option to remove excess skin. In England, there is no standardised guidance for the provision of body contouring following massive weight loss (British Association of Plastic and Reconstructive and Aesthetic Surgeons, 2014). It is funded by the NHS in exceptional medical circumstances and availability across the UK is not consistent (Mukherjee et al, 2014).

### Post-surgery considerations Pregnancy and bariatric surgery

Women who have had bariatric surgery are often advised to avoid pregnancy for the first 12 to 18 months after surgery (Mechanick et al, 2008). This is to ensure that women of child-bearing age have stabilised in weight and metabolic status after surgery. Pregnant women are advised to take 400 µg daily of folic acid until the 12<sup>th</sup> week of pregnancy to reduce the risk of neural tube defects in the fetus (NICE, 2008). For women with obesity or diabetes, 5 mg of folic acid daily is recommended until the 13<sup>th</sup> week of pregnancy (Centre for Maternal and Child Enquiries/Royal College of Obstetricians and Gynaecologist [CMACE/RCOG], 2010). This is available on prescription and should ideally be taken up to a month before conception.

Women who have had surgery and are planning to conceive are advised to avoid vitamin and mineral preparations that contain vitamin A in the retinol form in the first 12 weeks of pregnancy. Supplements containing vitamin A may increase the teratogenic risk and hence vitamin and mineral

supplements containing no vitamin A, which are specifically aimed at preconception and pregnancy, or taking vitamin A in the beta-carotene form are recommended (NICE, 2008).

Women who become pregnant following bariatric surgery should also have regular follow-up by their multidisciplinary bariatric team every trimester. Pregnant women, especially those who have had distal gastric bypass or biliopancreatic diversion, may be at risk of low vitamin A levels and should be monitored closely during pregnancy. A more frequent review with the specialist bariatric dietitian may be required if they have any complications or deficiencies.

### Diabetes and bariatric surgery

Remission of type 2 diabetes (defined as an HbA<sub>1c</sub> less than 48 mmol/mol [6.5%] when not using hypoglycaemic therapy) is sometimes observed following weight loss surgery and the rate of remission is highest among patients who have undergone biliopancreatic diversion, followed by gastric bypass and then sleeve gastrectomy (Sjöström et al, 2004; Sjöström, 2013). Remission is more likely to be encountered if the duration of diabetes is less than 10 years and patients are not on insulin prior to surgery. Severely obese people with type 1 diabetes who have undergone gastric bypass surgery have shown improved metabolic control and a reduced insulin requirement (Czupryniak et al, 2004). Remission of type 2 diabetes after surgery is hypothesised to be due to:

- An increase in glucagon-like peptide-1 response to a meal following surgically induced direct delivery of nutrients to the small intestine.
- Induction of sudden negative calorie balance by reduction in the food absorbed following surgery (Knop and Taylor, 2013).

With remission of type 2 diabetes or improvement in glycaemic control, most patients will not need to continue taking glucose-lowering medication. It is common for insulin to be discontinued immediately after surgery along with other oral medications for diabetes; however, in the author's experience, it is prudent to continue with standard preparation of metformin if it can be tolerated. Patients should be monitored for relapse of diabetes on a regular basis with at least yearly monitoring of HbA<sub>1c</sub>.

## Final thoughts

With the increase in incidence of obesity and diabetes, and the likely increase in bariatric procedures, clinicians should be aware of the key aspects of post-bariatric care. Every institution undertaking bariatric surgery should have a multidisciplinary team and a clear follow up and educational programme after weight loss surgery. ■

- Abell TL, Minocha A (2006) Gastrointestinal complications of bariatric surgery: diagnosis and therapy. *Am J Med Sci* **331**: 214–8
- Aills L, Blankenship J, Buffington C et al (2008) ASMBs Allied Health Nutritional guidelines for the surgical weight loss patient. *Surg Obes Relat Dis* **4**: S73–108
- Alqahtani AR, Elahmedi MO, Al Qahtani AR et al (2015) Laparoscopic sleeve gastrectomy in children and adolescents with Prader-Willi syndrome: a matched-control study. *Surg Obes Relat Dis* 22 Jul [Epub ahead of print]
- Al-Momani H, Williamson J, Greenslade B et al (2015) Biochemical monitoring and micronutrient replacement for patients undergoing bariatric surgery: A review of British Obesity and Metabolic Surgery Society guidelines. *British Journal of Obesity* **1**: 41–79
- Berg P, McCallum R (2015) Dumping syndrome: A review of the current concepts of pathophysiology, diagnosis, and treatment. *Dig Dis Sci* 22 Sep [Epub ahead of print]
- Björserud C, Fagevik Olsén M, Elander A, Wiklund M (2015) Objective measurements of excess skin in post bariatric patients – inter-rater reliability. *J Plast Surg Hand Surg* **1**: 1–6
- British Association of Plastic and Reconstructive and Aesthetic Surgeons (2014) *Commissioning guide: Massive Weight Loss Body Contouring*. The Royal College of Surgeons of England, London. Available at <http://bit.ly/1RH9qdp> (accessed 13.10.15)
- CMACE/RCOG (2010) Joint guideline on management of women with obesity in pregnancy. CMACE/RCOG, London. Available from: <http://bit.ly/1DFoGVT> (accessed 14.10.15)
- Czupryniak L, Strzelczyk J, Cypryk K et al (2004) Gastric bypass surgery in severely obese type 1 diabetic patients. *Diabetes Care* **27**: 2561–2
- De Cunto A, Barbi E, Minen F et al (2011) Safety and efficacy of high-dose acarbose treatment for dumping syndrome. *J Pediatr Gastroenterol Nutr* **53**: 113–4
- Diden P, Penning C, Masclee AAM (2006) Octreotide therapy in dumping syndrome: analysis of long-term results. *Aliment Pharmacol Ther* **24**: 1367–75
- Farrell TM, Haggerty SP, Overby DW et al (2009) Clinical application of laparoscopic bariatric surgery: an evidence-based review. *Surg Endosc* **23**: 930–49
- Franco JV, Ruiz PA, Palermo M, Gagner M (2011) A review of studies comparing three laparoscopic procedures in bariatric surgery: sleeve gastrectomy, Roux-en-Y gastric bypass and adjustable gastric banding. *Obes Surg* **21**: 1458–68
- Fujioka K (2005) Follow-up of nutritional and metabolic problems after bariatric surgery. *Diabetes Care* **28**: 481–4
- Fujioka K, DiBaise JK, Martindale RG (2011) Nutrition and metabolic complications after bariatric surgery and their treatment. *JPEN J Parenter Enteral Nutr* **35**(Suppl 5): S25–9S
- Gracia JA, Martinez M, Aguilera V (2007) Postoperative morbidity of biliopancreatic diversion depending on common limb length. *Obes Surg* **17**: 1306–11
- Health and Social Care Information Centre (2014) *Lifestyles Statistics. Statistics on obesity, physical activity and diet: England 2014*. The Health and Social Care Information Centre, Leeds. Available at: <http://www.hscic.gov.uk/catalogue/PUB13648/Obes-phys-act-diet-eng-2014-rep.pdf> (accessed 14.10.15)
- Heber D, Greenway FL, Kaplan LM et al (2010) Endocrine and nutritional management of the post-bariatric surgery patient: an Endocrine Society Clinical Practice Guideline. *J Clin Endocrinol Metab* **95**: 4823–43
- Kim JH, Wolfe B (2012) Bariatric/metabolic surgery: short- and long-term safety. *Curr Atheroscler Rep* **14**: 597–605
- Knop FK, Taylor R (2013) Mechanism of metabolic advantages after bariatric surgery: it's all gastrointestinal factors versus it's all food restriction. *Diabetes Care* **36**(Suppl 2): S287–91
- Luber SD, Fischer DR, Venkat A (2008) Care of the bariatric surgery patient in the emergency department. *J Emerg Med* **34**: 13–20
- Mechanick JL, Kushner RF, Sugerman HJ et al (2008) American Association of Clinical Endocrinologists, The Obesity Society, and American Society for Metabolic & Bariatric Surgery Medical Guidelines for Clinical Practice for the perioperative nutritional, metabolic, and nonsurgical support of the bariatric surgery patient. *Surg Obes Relat Dis* **4**(Suppl 5): 109–84
- Mechanick JL, Youdim A, Jones DB et al (2013) Clinical practice guidelines for the peri-operative nutritional, metabolic, and nonsurgical support of the bariatric surgery patient – 2013 update: Cosponsored by the American Association of Clinical Endocrinologist, The Obesity Society, and American Society for Metabolic and Bariatric Surgery. *Surg Obes Relat Dis* **9**: 159–91
- Mitchell JE, Crosby RD, Ertlet TW et al (2008) The desire for body contouring surgery after bariatric surgery. *Obes Surg* **18**: 1308–12
- Mukherjee S, Kamat S, Adegbola S, Agrawal S (2014) Funding for postbariatric body-contouring (bari-lic) surgery in England: a postcode lottery. *Plast Surg Int* **2014**: 153194
- NICE (2008) *Maternal and child nutrition* (PH11). NICE, London. Available at: [www.nice.org.uk/guidance/ph11](http://www.nice.org.uk/guidance/ph11) (accessed 14.10.15)
- NICE (2014) *Obesity: identification, assessment and management of overweight and obesity in children, young people and adults* (CG189). NICE, London. Available at: <https://www.nice.org.uk/guidance/cg189> (accessed 14.10.15)
- O'Kane M, Pinkney J, Aasheim ET et al (2014) *BOMSS Guidelines on Peri-operative and Postoperative Biochemical Monitoring and Micronutrient Replacement for Patients Undergoing Bariatric Surgery*. BOMSS, London. Available at: <http://bit.ly/1HnZTV0> (accessed 15.06.15)
- Pugnale N, Giusti V, Suter S et al (2003) Bone metabolism and risk of secondary hyperparathyroidism 12 months after gastric banding in obese pre-menopausal women. *Int J Obes* **27**: 110–6
- Sanghera TS, Kang SN, Hamdan K (2012) Metabolic bone disease and bariatric surgery. *Rheumatol Curr Res* **55**: 001
- Schauer PR, Bhatt DL, Kirwan JP et al (2014) Bariatric surgery versus intensive medical therapy for diabetes – 3 year outcomes. *N Engl J Med* **370**: 2002–13
- Schumann R (2013) Pulmonary physiology of the morbidly obese and the effects of anesthesia. *Int Anesthesiol Clin* **51**: 41
- Sjöström L (2013) Review of the key results from the Swedish Obese Subjects (SOS) trial – a prospective controlled intervention study of bariatric surgery. *J Intern Med* **273**: 219–34
- Sjöström L, Lindroos AK, Peltonen M et al (2004) Lifestyle, diabetes, and cardiovascular risk factors 10 years after bariatric surgery. *N Engl J Med* **351**: 2683–93
- Song AY, Rubin JP, Thomas V et al (2006) Body image and quality of life in post massive weight loss body contouring patients. *Obesity* **14**: 1626–36
- Staalesen T, Fagevik Olsen M, Elander A (2013) Experience of excess skin and desire for body contouring surgery in postbariatric patients. *Obes Surg* **23**: 1632–44
- Tice JA, Karliner L, Walsh J et al (2008) Gastric banding or bypass: a systematic review comparing the two most popular bariatric procedures. *Am J Med* **121**: 885–93
- Williams SE (2011) Metabolic bone disease in the bariatric surgery patient. *J Obes* **2011**: 634614
- Xanthakos SA (2009) Nutritional deficiencies in obesity and after bariatric surgery. *Pediatr Clin North Am* **56**: 1105–21
- Xanthakos SA, Thomas IH (2006) Nutritional consequences of bariatric surgery. *Curr Opin Clin Nutr Metab Care* **9**: 489–96

**“...clinicians should be aware of the key aspects of post-bariatric surgery care.”**



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## Q&A

# Post-bariatric surgery care

**At the 7<sup>th</sup> National Diabesity Forum conference in July this year, delegates wanted to know more information on post bariatric surgery care once an individual is discharged from the surgical team and returned to primary care. Here, Roger Ackroyd, Consultant General & Bariatric Surgeon at Sheffield Hospital Trust, answers the frequently asked questions based on the procedures carried out in his clinic in Sheffield.**

### Q When and how often do you see bariatric patients post-surgery?

After someone has received bariatric surgery, we arrange appointments to see them 1-month post-op and then at 3, 6, 12, 18 and 24 months.

### Q What blood tests do you run and when?

We check bloods annually after surgery and test for the following:

- FBC – Full blood count.
- U+Es – Urea and electrolytes.
- LFTs – Liver function tests.
- TFTs – Thyroid function tests.
- Fe – Iron.
- Ca – Calcium.
- Vitamin D.
- Folate.
- Vitamin B12.
- PTH – Parathyroid hormone.
- Se – Selenium.
- Zn – Zinc.

### Q When do you suggest stopping anti-diabetes medication?

If they are on oral glucose-lowering medication,

we stop them immediately post-op. If they are also on insulin, we also stop this immediately after surgery and then the oral agents a few weeks later if the blood glucose is in the target range.

### Q What is included in the long-term care for bariatric patients?

At the clinic in Sheffield, we put them on life-long oral daily multivitamins and 3-monthly vitamin B12 injections.

### Q Who in the medical team should review their progress?

We follow them up in hospital for 2 years (doctors, nurses, dietitians) and then we discharge them back to GP care.

### Q What are the first things I need to do as a primary care clinician when bariatric patients return to the surgery's care?

Nothing immediately. Just follow them up indefinitely. Annual bloods as above. Nil else specific. Contact the surgical team if you are not sure or have any problems. ■

If there are any diabesity-related questions that you would like answered, please email them to [dip@sbcommunicationsgroup.com](mailto:dip@sbcommunicationsgroup.com)

## Online CPD activity

Visit [www.diabetesonthenet.com/cpd](http://www.diabetesonthenet.com/cpd) to record your answers and gain a certificate of participation

Participants should read the preceding article before answering the multiple choice questions below. There is ONE correct answer to each question. After submitting your answers online, you will be immediately notified of your score. A pass mark of 70% is required to obtain a certificate of successful participation; however, it is possible to take the test a maximum of three times. A short explanation of the correct answer is provided. Before accessing your certificate, you will be given the opportunity to evaluate the activity and reflect on the module, stating how you will use what you have learnt in practice. The CPD centre keeps a record of your CPD activities and provides the option to add items to an action plan, which will help you to collate evidence for your annual appraisal.

**1. Which is the MOST COMMONLY performed bariatric surgical procedure in the UK? Select ONE option only.**

- A. Gastric balloon
- B. Gastric banding
- C. Gastric bypass
- D. Laparoscopic sleeve gastrectomy
- E. Open sleeve gastrectomy

**2. Which is the LEAST EFFECTIVE bariatric surgical procedure in terms of likely weight loss? Select ONE option only.**

- A. Gastric banding
- B. Laparoscopic sleeve gastrectomy
- C. Roux-en-Y gastric bypass with biliopancreatic diversion
- D. Roux-en-Y gastric bypass with biliopancreatic diversion and duodenal switch

**3. According to NICE guidance, which ONE of the following is the MOST APPROPRIATE to consider for bariatric surgery? Select ONE option only.**

- A. A 21-year-old person with Prader-Willi syndrome and a BMI of 29 kg/m<sup>2</sup>
- B. A 35-year-old person with type 2 diabetes and a BMI of 34 kg/m<sup>2</sup>
- C. A 49-year-old person with hypertension and a BMI of 39 kg/m<sup>2</sup>
- D. A 53-year-old person with a BMI of 43 kg/m<sup>2</sup>
- E. A 57-year-old person with severe depression and a BMI of 50 kg/m<sup>2</sup>

**4. A 49-year-old morbidly obese man fulfils the criteria to undergo NHS-funded bariatric surgery. He has a normal full blood count, urea and**

**electrolytes, liver function test, ferritin, folate, calcium, vitamin D, glucose, HbA<sub>1c</sub> and lipid profile. Which ONE of the following ADDITIONAL blood tests are routinely recommended pre-operatively? Select ONE option only.**

- A. Erythrocyte sedimentation rate
- B. Gamma-glutamyl transpeptidase
- C. Parathyroid hormone
- D. Transferrin saturation
- E. Zinc

**5. According to 2012 data, what is the peri-operative mortality rate for bariatric surgery? Select ONE option only.**

- A. <0.5%
- B. 1%
- C. 2%
- D. 3%
- E. 5%

**6. A 55-year-old man had a gastric bypass 12 months ago. He has since developed increasing symptoms of abdominal pain, sweating, nausea, flushing and diarrhoea. Which is the MOST LIKELY diagnosis? Select ONE option only.**

- A. Bacterial overgrowth in the small intestine
- B. Dumping syndrome
- C. Irritable bowel
- D. Pancreatic insufficiency
- E. Oesophageal stricture

**7. Which lifelong daily supplement is recommended for all patients after bariatric surgery IN ADDITION to multivitamins? Select ONE option only.**

- A. Calcium and vitamin D

- B. Iron
- C. Folic acid
- D. Vitamin B12
- E. Vitamin E

**8. Which is the MOST EFFECTIVE bariatric surgical procedure in terms of the potential remission of type 2 diabetes (HbA<sub>1c</sub> <48 mmol/mol [6.5%])? Select ONE option only.**

- A. Gastric banding
- B. Gastric bypass
- C. Laparoscopic sleeve gastrectomy
- D. Roux-en-Y gastric bypass with biliopancreatic diversion
- E. Sleeve gastrectomy

**9. Which is the MOST APPROPRIATE drug treatment for late dumping syndrome? Select ONE option only.**

- A. Acarbose
- B. Gliclazide
- C. Metformin
- D. Pioglitazone
- E. Sitagliptin

**10. What is the MINIMUM recommended time interval a woman should avoid pregnancy, if any, after weight loss surgery? Select ONE option only.**

- A. 3 months
- B. 6 months
- C. 12 months
- D. 36 months
- E. No minimum interval