Management of people with diabesity before, during and after bariatric surgery

Fiona Chan

Citation: Chan F (2012) Management of people with diabesity before, during and after bariatric surgery. *Diabesity in Practice* **1**: 58–62

Article points

1. Bariatric surgery is increasingly recognised as an effective and cost-effective way to induce weight loss in morbidly obese people, especially adults with comorbidities or chronic conditions such as type 2 diabetes.
2. Apart from causing rapid weight loss, bariatric surgery has also been found to have the added benefit of reducing hyperglycaemia in type 2 diabetes and, in some people, restoring normoglycaemia, which often results almost immediately after surgery.
3. Potential long-term benefits of bariatric surgery as a treatment for type 2 diabetes warrant further research in balance with the potential long-term complications of bariatric surgery.

Key words

- Bariatric surgery
- Diet
- Follow-up
- Psychological support

Author

Fiona Chan is a Specialist Weight Management Dietitian, Salford Royal Foundation Trust, Salford.

Various bariatric surgery procedures are available for people with diabesity who fulfil criteria set out by NICE (2006) guidance, but the preparation and follow-up of individuals undergoing surgery is less clear. This article reviews preoperative assessments (including sleep apnoea, anaesthetic, cardiac, respiratory, psychological and glycaemic assessments), the liver reduction diet, the recovery diet, nutritional requirements and psychological support as part of holistic management of people with diabesity undergoing bariatric surgery. A case study illustrates the experience of one individual who had a laparoscopic gastric bypass.

Obesity has long been described as an "epidemic" within developed countries, however with rising prevalence in developing countries in recent years it threatens to become a global trend. An NHS report on statistics of obesity, diet and physical activity in UK showed that in 2009, almost a quarter of the adult population in England was classified as obese (defined as a BMI >30 kg/m^2). Furthermore, it is forecasted that by 2025, 47% of men and 36% of women will be classified as obese. Obesity is an important risk factor for type 2 diabetes and accounts for 80–85% of the overall risk for developing diabetes (Diabetes UK, 2010). There is a relative risk of 5.2 for men and 12.7 for women for developing type 2 diabetes in the obese population (NHS Information Centre, 2012).

It is projected that the cost to treat obesity-related and preventable diseases will increase by approximately £2 billion per year. Furthermore, approximately 10% of the NHS annual budget will fund treatments of diabetes, which amounts to approximately £9 billion per year (Hex et al, 2012). It is increasingly important that the rising trend for obesity and its related conditions such as type 2 diabetes is reversed.

Bariatric surgery procedures

Bariatric surgery is increasingly recognised as an effective and cost-effective way to induce weight loss in morbidly obese people, especially adults with comorbidities or chronic conditions such as type 2 diabetes (Sjöström et al 2004). Bariatric surgery encompasses several procedures and some of the most common ones include laparoscopic adjustable gastric band, sleeve gastrectomy and gastric bypass. These procedures exert their effects by restriction with or without malabsorption, thus inducing rapid weight loss.

The laparoscopic adjustable gastric band (LAGB) promotes satiety after a small amount of food by stimulating the stretch receptors in the oesophagus, thus producing early satiety signals.

Sleeve gastrectomy (SG) is effective in restricting food intake owing to the severely reduced stomach

size. Because of the resected fundus and greater curvature sections of the stomach (both of which are ghrelin production sites), plasma ghrelin levels are reduced, which also contributes to reduced appetite, thus inducing weight loss (Australia and New Zealand Horizon Scanning Network, 2007).

Laparoscopic Roux-en-Y gastric bypass (LYGB) is a procedure that has both restrictive and malabsorptive effects. The stomach is reduced to a small pouch size in conjunction with bypassing a part of intestine to produce restriction and malabsorption.

Apart from causing rapid weight loss, bariatric surgery has also been found to have the added benefit of reducing hyperglycaemia in type 2 diabetes and, in some people, restoring normoglycaemia, which often results almost immediately after surgery (Scheen et al, 2009; Gill et al, 2010).

Given the increasing prevalence of obesity and diabetes and the benefits of bariatric surgery on comorbidities such as type 2 diabetes, the proportion of people with type 2 diabetes who are eligible for bariatric surgery continues to rise (Kaul and Sharma, 2011).

Preoperative management

Assessment

The International Diabetes Federation statement for obese type 2 diabetes (Dixon et al, 2011) and NICE (2006) guidance on obesity both note that comprehensive preoperative assessments by an experienced multi-disciplinary team (typically including the bariatric surgeon, endocrinologists, specialist bariatric nurses, specialist dietitians, anaesthetists and possibly clinical psychologists) are crucial.

Assessments may include medical assessment; a sleep apnoea test; a general preoperative assessment (including anaesthetic, cardiac and respiratory); and psychological and glycaemic control assessments. The results of these tests may affect peri- and postoperative management. Education regarding the general and dietary management pre- and postoperation is conveyed via different methods including education sessions and one-to-one consultations. Guidelines by Dixon et al (2011) and Mechanick et al (2008) emphasised the importance of attaining good glycaemic control and some weight loss preoperatively for the successful outcome of surgery.

Liver reduction diet

Preoperative weight loss and shrinkage in liver volume may prove helpful in the technical aspects of surgery (Mechanick et al, 2008). A liver reduction diet is therefore used to reduce the amount of glycogen and water storage, thus minimising the size of the liver. It is highly restrictive in carbohydrates, fat and calories and can take several forms, such as a very-low-calorie diet, milk and yoghurt diet or meal replacements (Fris, 2004). Regular blood glucose monitoring is essential during this time as the dietary restrictions can lead to hypoglycaemia, especially if diabetes is treated with pharmacological or insulin therapy. Advice is given to reduce oral antidiabetes drugs or insulin if hypoglycaemia becomes a regular occurrence.

Page points

1. Sleeve gastrectomy is effective in restricting food intake owing to the severely reduced stomach size. Because of the resected fundus and greater curvature sections of the stomach (both of which are ghrelin production sites), plasma ghrelin levels are reduced, which also contributes to reduced appetite, thus inducing weight loss.
2. Apart from causing rapid weight loss, bariatric surgery has also been found to have the added benefit of reducing hyperglycaemia in type 2 diabetes and, in some people, restoring normoglycaemia, which often results almost immediately after surgery.

Box 1. Case study.

Mrs X, a 53-year-old woman with multiple comorbidities including type 2 diabetes, hypertension, dyslipidaemia, vertebrae disc prolapse and protrusion, first sought help in a medical weight-management clinic to lose weight. She had battled with obesity from a very early age and tried numerous ways to lose weight including lifestyle measures such as diet and pharmacotherapy to no avail. As a result of the repeated cycle of weight loss and regain, her weight has increased gradually over the years to 119 kg with a BMI of 46.2 kg/m^2 in 2008. A funding application was made by her GP to her local primary care trust in accordance with the NICE (2006) clinical guidelines for treatment of obesity.

Once funding was approved, Mrs X was reviewed in a multidisciplinary clinic for education regarding bariatric procedures and preoperative assessments medically and psychologically. Mrs X was diagnosed with obstructive sleep apnoea and was provided with a continuous positive airway pressure machine prior to surgery.

Mrs X was discharged after a 2-night hospital stay post-laparoscopic gastric bypass. During her hospital stay, her diabetes medication was stopped by a diabetes specialist nurse and a blood glucose monitoring device issued. She was advised to monitor her blood glucose level on a daily basis following discharge. Specialist nurse and dietetic input were provided at regular intervals prior to and following discharge via clinic appointments and telephone reviews.

Mrs X was followed up surgically in the early months post-surgery (once per week for a few weeks after surgery, spacing out gradually to every 2–3 months until reviews are annual), followed by regular reviews by a senior member of the medical and dietetic teams to minimise the risks of nutritional deficiency. She complied with the stages of the recovery diet under dietetic guidance. She suffered no nausea, vomiting or dumping syndrome and was advised to take her nutritional supplements on a daily basis as prescribed. She had regular dietetic follow-up appointments to ensure her diet was adequate in nutrition.

Since surgery, she has made substantial progress in her weight and health. She has been taken off several medications. At 2 years post-surgery, her weight had reduced from 120.5 kg to 84.4 kg and BMI reduced from 45.9 to 32.9 kg/m^2. Her blood pressure has returned within healthy range from 154/99 mmHg to 125/72 mmHg. Owing to satisfactory glycaemic control with her baseline HbA_{1c} level of 49 mmol/mol (6.6%) reducing to 34 mmol/mol (5.3%), diabetes medications remained unnecessary.

Page points

1. Individual centres differ in details and length of stages during the recovery diet. Nevertheless, in principle, the consistency moves from fluids through to solid foods within 3 months.
2. Procedures such as laparoscopic Roux-en-Y gastric bypass and biliopancreatic diversion, which involve malabsorption, can induce normalisation in glycaemia with immediate effects post operatively.
3. Individuals who have undergone bariatric surgery typically require a relatively short stay in hospital. They are discharged with a follow-up care plan from the multidisciplinary team that may consist of regular telephone and clinic reviews.
4. Being able to achieve the recommended daily intake of 60–120 g of protein remains a challenge for the majority of bariatric surgery patients.

Postoperative management

Recovery diet

Individual centres differ in details and length of stages during the recovery diet. Nevertheless, in principle, the consistency moves from fluids through to solid foods within 3 months (*Table 1*). Optimal glycaemic control is achieved through a combination of diabetes medication, diet and blood glucose monitoring. A regular meal pattern inclusive of all food groups is advised, emphasising the importance of sufficient protein intake.

Diabetes remission

It is commonly accepted that bariatric surgery is successful in inducing a biochemical remission of type 2 diabetes, which can be through rapid weight loss post-surgery (Wilson and Pories, 2010). There is not enough evidence to suggest that background risks and inherent tendency to progress to diabetes is altered by bariatric surgery itself. However, procedures such as RYGB and biliopancreatic diversion (BPD), which involve malabsorption, can induce normalisation in glycaemia with immediate effects postoperatively (Polyzogopoulou et al 2003; Mingrone et al, 2009; Demssie et al, 2012). A meta-analysis by Wilson and Pories (2010) showed 78.1% of full remission from type 2 diabetes and 86.6% of improved or resolved type 2 diabetes. The mechanism of remitted diabetes is suggested to lie within the altered gut anatomy and food transit mechanism, independent of weight loss (Ferchak and Meneghini, 2004; Mingrone et al, 2009). Individuals with remission of diabetes were able to discontinue all medications for diabetes with normal glycaemic and HbA_{1c} levels (Cummings et al, 2005). Although studies have shown strong evidence for diabetes remission post-bariatric surgery, further research is required to explore the duration of remission, as recent evidence has suggested a possibility for re-emergence of diabetes in the mid- to long-term following bariatric surgery (DiGiorgi et al, 2010).

Late postoperative period

Individuals who have undergone bariatric surgery typically require a relatively short stay in hospital. They are discharged with a follow-up care plan from the multidisciplinary team that may consist of regular telephone and clinic reviews. The length of follow-up postoperatively varies in different centres and typically lasts at least 2 years. NICE (2006) recommends that follow-up is long-term.

Nutritional deficiencies

Macronutrients

Being able to achieve the recommended daily intake of 60–120 g of protein remains a challenge for the majority of bariatric surgery patients (Mechanick et al, 2008; Heber et al, 2010). Traditional dietary guidance for people with diabetes are based on a regular intake of carbohydrates (Diabetes UK, 2012), hence sufficient protein can be overlooked. Hair loss can be an early indication of protein deficiency, with oedema and muscle wasting as long-term manifestations (Koch and Finelli, 2010).

Micronutrients

A multivitamin and mineral supplement is routinely recommended following bariatric surgery, alongside additional supplementation of specific nutrients, especially if the procedure has a malabsorptive component (Heber et al, 2010). Micronutrient supplementation is typically via an

Table 1. Stages of recovery diet following bariatric surgery.

Stage of recovery diet	Fluids/food	Remarks
Fluids	Fluids with no solids are recommended. The types of fluids taken are carefully monitored to ensure maximising of nutrients.	• Protein intake is carefully monitored to achieve as near to 60–80 g/day as possible with supplementation if required.
Pureed	Blended foods or soups with no large lumps.	• Small and frequent fluid intake is recommended throughout the day.
Soft to normal	Soft foods building up to foods of normal consistency.	

oral route; however, some nutrients can be given intramuscularly such as vitamin B12 and thiamine (Koch and Finelli, 2010). Regular monitoring is recommended to identify early nutritional deficiencies.

Dumping syndrome

Dumping syndrome is common in people who have undergone LYGB or BPD and occurs less frequently after SG. Within 30 minutes of ingestion of calorie-dense liquid or food, osmotic overload occurs within the intestine, caused by hyperosmolarity, which draws fluid into the intestinal lumen, leading to symptoms such as abdominal pain, cramping, nausea, lightheadedness, flushing, tachycardia, sweating and even syncope (Ziegler et al, 2009). In late dumping syndrome, however, hypoglycaemia also occurs, in a similar fashion to reactive hypoglycaemia. A review by Ritz and Hanaire (2011) showed that only approximately 23% of people with diabetes suffer from reactive hypoglycaemia, with a very rare occurrence of severe symptoms and similar prevalence of reactive hypoglycaemia in people with or without remitted diabetes.

Psychological support and long-term follow-up

The psychological effects of bariatric surgery should not be overlooked, as suboptimal outcomes are often attributed to behavioural or psychological reasons (Ames et al, 2009). Clinical psychologists play an important role in providing support as necessary before and after surgery as the positive change accompanied by rapid weight loss is not universal. Other existing chronic conditions, such as diabetes, also have an effect (Sarwer et al, 2008).

It is imperative that individuals are reviewed regularly on a long-term basis within an experienced multidisciplinary team for continual support even after diabetes remission. Access to adequate support that can help individuals to maintain their new lifestyle is important for an optimum outcome post-surgery, and for prevention of weight regain.

Weight regain

Weight regain can occur any time following surgery, but is most common between 2 and 10 years after the procedure (Ames et al, 2009; Himpens et al, 2010). It is usually characterised by a gradual increase in calorific intake and reduction of physical activity in addition to possible bowel adaptations (Christou et al, 2006). Reversal of eating behaviour and eating patterns to an individual's pre-surgical state is one of the predictors for weight gain (Faria et al, 2008). Apart from dietary and psychological factors, weight regain may relate to technical failures such as gastric pouch dilatation, gastrojejunal anastomosis dilation and complications related to gastric bands (Dapri et al, 2011). In such cases, revision surgery may be carried out with greater technical difficulty and as a result carries higher risks of mortality and morbidity compared with primary procedures (Lim et al, 2009). It is therefore crucial for regular follow-up and timely intervention to take place, to minimise the amount of weight regain.

Conclusion

It is widely accepted that bariatric surgery can be used as a treatment for morbid obesity, especially in people with comorbidities such as type 2 diabetes. The importance of achieving optimum glycaemic control before, during and after surgery is a vital part of patient care and is crucial to achieving good outcomes. It is important that the multidisciplinary bariatric team has a holistic and realistic approach towards the care of individuals undergoing surgery. However, the potential long-term benefits of bariatric surgery as a treatment for type 2 diabetes warrant further research in balance with the potential long-term complications of bariatric surgery. Currently, there are no established clinical guidelines on the management of diabetes post-bariatric surgery; therefore more studies are needed in this area. ■

Ames GE, Patel RH, Ames SC, Lynch SA (2009) Weight loss surgery: patients who regain. *Obesity and Weight Management* **5**: 154–61

Australia and New Zealand Horizon Scanning Network (2007) *Horizon Scanning Technology Horizon Scanning Report: Sleeve Gastrectomy as a Single Stage Bariatric Procedure*. Royal Australasian College of Surgeons, North Adelaide

Christou NV, Look D, Maclean LD (2006) Weight gain after short- and long-limb gastric bypass in patients followed for longer than 10 years. *Ann Surg* **244**: 734–40

Page points

1. Dumping syndrome occurs within 30 minutes of ingestion of calorie-dense liquid or food. Osmotic overload occurs within the intestine, caused by hyperosmolarity, which draws fluid into the intestinal lumen, leading to symptoms such as abdominal pain, cramping, nausea, lightheadedness, flushing, tachycardia, sweating and even syncope.
2. The psychological effects of bariatric surgery should not be overlooked, as suboptimal outcomes are often attributed to behavioural or psychological reasons.
3. It is widely accepted that bariatric surgery can be used as a treatment for morbid obesity, especially in people with comorbidities such as type 2 diabetes.

"The importance of achieving optimum glycaemic control before, during and after surgery is a vital part of patient care and is crucial to achieving good outcomes. It is important that the multidisciplinary bariatric team has a holistic and realistic approach towards the care of individuals undergoing surgery."

Cummings DE, Overduin J, Shannon MH et al (2005) Hormonal mechanisms of weight loss and diabetes resolution after bariatric surgery. *Surg Obes Relat Dis* **1**: 358–68

Dapri G, Cadière GB, Himpens J (2011) Laparoscopic conversion of Roux-en-Y gastric bypass to distal gastric bypass for weight regain. *J Laparoendosc Adv Surg Tech A* **21**: 19–23

Demssie YN, Jawaheer J, Farook S et al (2012) Metabolic outcomes 1 year after gastric bypass surgery in obese people with type 2 diabetes. *Med Princ Pract* **21**: 125–8

Diabetes UK (2010) *Diabetes in the UK 2010: Key statistics on diabetes*. Diabetes UK, London. Available at: http://bit.ly/eYhDZK (accessed 11.06.12)

Diabetes UK (2012) Eating well. Available at: http://bit.ly/rqMPX4 (accessed 13.06.12)

DiGiorgi M, Rosen DJ, Choi JJ et al (2010) Re-emergence of diabetes after gastric bypass in patients with mid- to long-term follow-up. *Surg Obes Relat Dis* **6**: 249–53

Dixon JB, Zimmet P, Alberti KG et al (2011) Bariatric surgery: an IDF statement for obese type 2 diabetes. *Arq Bras Endocrinol Metabol* **55**: 367–82

Faria SL, de Oliveira Kelly E, Lins RD, Faria OP (2008) Nutritional management of weight regain after bariatric surgery. *Obes Surg* **20**: 135–9

Ferchak CV, Meneghini LF (2004) Obesity, bariatric surgery and type 2 diabetes – a systematic review. *Diabetes Metab Res Rev* **20**: 438–45

Fris RJ (2004) Preoperative low energy diet diminishes liver size. *Obes Surg* **14**: 1165–70

Gill RS, Birch DW, Shi X et al (2010) Sleeve gastrectomy and type 2 diabetes mellitus: a systematic review. *Surg Obes Relat Dis* **6**: 707–13

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

Hex N, Bartlett C, Wright D et al (2012) Estimating the current and future costs of Type 1 and Type 2 diabetes in the UK, including direct health costs and indirect societal and productivity costs. *Diabet Med* **Apr 26** [Epub ahead of print]

Himpens J, Dobbeleir J, Peeters G et al (2010) Long-term results of laparoscopic sleeve gastrectomy for obesity. *Ann Surg* **252**: 319–24

Kaul A, Sharma J (2011) Impact of bariatric surgery on comorbidities. *Surg Clin North Am* **91**: 1295–312

Koch TR, Finelli FC (2010) Postoperative metabolic and nutritional complications of bariatric surgery. *Gastroenterol Clin North Am* **39**: 109–24

Lim CS, Liew V, Talbot ML et al (2009) Revisional bariatric surgery. *Obes Surg* **19**: 827–32

Mechanick JI, 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**(5 Suppl): S109–84

Mingrone G, Castagneto-Gissey L (2009) Mechanisms of early improvement/resolution of type 2 diabetes after bariatric surgery. *Diabetes Metab* **35**: 518–23

NHS Information Centre (2012) *Statistics on Obesity, Physical Activity and Diet: England 2012*. NHS Information Centre, Leeds

NICE (2006) *Obesity: Guidance on the Prevention, Identification, Assessment and Management of Overweight and Obesity in Adults and Children*. NICE, London

Polyzogopoulou EV, Kalfarentzos F, Vagenakis AG, Alexandrides TK et al (2003) Restoration of euglycemia and normal acute insulin response to glucose in obese subjects with type 2 diabetes following bariatric surgery. *Diabetes* **52**: 1098–103

Ritz P, Hanaire H (2011) Post-bypass hypoglycaemia: a review of current findings. *Diabetes Metab* **37**: 274–81

Sarwer DB, Fabricatore AN, Jones-Corneille LR et al (2008) Psychological issues following bariatric surgery. *Primary Psychiatry* **15**: 50–55

Scheen AJ, De Flines J, De Roover A, Paquot N (2009) Bariatric surgery in patients with type 2 diabetes: benefits, risks, indications and perspectives. *Diabetes Metab* **35**: 537–43

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

Wilson JB, Pories WJ (2010) Durable remission of diabetes after bariatric surgery: What is the underlying pathway? *Insulin* **5**: 46–55

Ziegler O, Sirveaux MA, Brunaud L et al (2009) Medical follow up after bariatric surgery: nutritional and drug issues. General recommendations for the prevention and treatment of nutritional deficiencies. *Diabetes Metab* **35**: 544–57