

Obesity

The impact of bariatric surgery on diabetes complications



Shahrad Taheri,
Senior Lecturer
in Endocrinology,
University of
Birmingham,
Birmingham

NICE recommends bariatric surgery for individuals with BMI ≥ 35 kg/m² and a co-morbidity such as diabetes mellitus or BMI ≥ 40 kg/m² without a co-morbidity (NICE, 2006). NICE also recommends bariatric surgery to be considered as first-line treatment for those with BMI ≥ 50 kg/m².

Previously, these guidelines have not been universally followed in the UK, but with the recent introduction of centralised commissioning, the NICE criteria will be followed in England providing more equitable access. It is estimated that about 800 000 individuals will meet the criteria for bariatric surgery in England; about 7% of these will have a BMI ≥ 50 kg/m² (NHS Commissioning Board, 2012). Even after doubling bariatric surgery provision in the NHS, it will only be possible to treat 2–3% of eligible individuals annually. With increasing appreciation for the metabolic benefits of surgery, future guidelines are likely to recommend bariatric surgery for select individuals with a BMI of < 35 kg/m².

Currently, depending on the bariatric centre, approximately a third of patients undergoing bariatric surgery have diabetes. Diabetes appears to be responsive to bariatric surgery with significant improvement/remission after surgery based on markers of glycaemic control and reduction/discontinuation of diabetes medications (Buchwald et al, 2009; Leong and Taheri, 2012). Diabetes, however, is a complex disease with abnormalities beyond glycaemia. There is currently insufficient evidence that bariatric surgery reduces the risk of macrovascular complications and/or mortality in people with diabetes. The strongest data available are from the Swedish Obesity Study (SOS), which was not restricted to patients with diabetes. The SOS study observed reduced mortality in patients after bariatric surgery compared to controls, which was attributed to reduced cardiovascular disease and cancer (Sjöström et al, 2007). The SOS study was carried out at a time when intensive treatment for cardiovascular disease such as statin use and tight blood pressure control was less commonplace.

Little is known about the impact of bariatric surgery on diabetes-related microvascular complications, which also have devastating consequences for patients. Diabetes continues to be the major cause of blindness and end-stage renal disease. Miras and colleagues (2012) reported on 84 patients with diabetes who underwent bariatric surgery procedures. They reported that in 67 patients with data available only 1.5% had deterioration of diabetic retinopathy (DR), while

retinopathy improved in 17.8%. In another cohort of 71 patients undergoing bariatric surgery, however, Leong and Taheri (2013) found that retinopathy worsened in 14.1%. There was no development of sight-threatening retinopathy. Thus, the impact of bariatric surgery on DR is unclear and requires further study.

Heneghan and colleagues (summarised alongside) report on 52 patients with diabetes who were followed up for 5 years. Prior to surgery, 37.6% had some evidence of urinary protein leak with 6.3% having macroalbuminuria. After more than 5 years, the percentage with renal protein leak reduced to 32.4%. Miras and colleagues (2012) also noted an improvement in albuminuria in 32 of their patients who had data available. There is increasing evidence for an important role of obesity in the development and progression of renal disease (Ting et al, 2009). Several studies have shown an improvement in renal function after bariatric surgery (Navaneethan et al, 2009; Jose et al, 2013). Given the increasing prevalence of chronic kidney disease (CKD) and its impact on healthcare costs, these studies suggest that in some patients, CKD should be considered as a potential indication for bariatric surgery.

There are still many unresolved questions regarding the impact of bariatric surgery on glycaemic control, macro- and microvascular complications in diabetes. Furthermore, greater information is required regarding the cost-effectiveness of bariatric procedures in the context of diabetes. Careful follow-up and accurate data collection should allow a balanced assessment of the benefits and risks of bariatric surgery in the diabetes population. The time is right for further support and development of a more detailed and complete national patient bariatric register that captures both medical and surgical data of interest.

Buchwald H, Estok R, Fahrbach K et al (2009) Weight and T2D after bariatric surgery. *Am J Med* **122**: 248–56.e5

Jose B, Ford S, Super P et al (2013) The effect of biliopancreatic diversion surgery on renal function. *Obes Surg* **23**: 634–7

Leong WB, Taheri S (2012) The role of bariatric surgery in the treatment of T2D. *J R Coll Physicians Edinb* **423**: 194–8

Leong WB, Taheri S (2013) The progression of diabetic retinopathy post bariatric surgery. *Diabetes Care* (in press)

Miras AD, Chuah LL, Lascaratos G et al (2012) Bariatric surgery does not exacerbate and may be beneficial for the microvascular complications of T2D. *Diabetes Care* **35**: e81

Navaneethan SD, Yehner H, Moustarah F et al (2009) Weight loss interventions in CKD. *Clin J Am Soc Nephrol* **4**: 1565–74

NHS Commissioning Board (2012) Clinical commissioning policy: Complex and specialised obesity surgery. Available at: <http://bit.ly/1302y0a>

NICE (2006) Obesity guidance on the prevention, identification, assessment and management of overweight and obesity in adults and children. Available at: <http://bit.ly/hhFfw>

Sjöström L, Narbro K, Sjöström CD (2007) Effects of bariatric surgery on mortality in Swedish obese subjects. *N Engl J Med* **238**: 741–52

Ting SM, Nair H, Ching I et al (2009) Overweight, obesity and CKD. *Nephron Clin Pract* **112**: 121–7

SURG OBES RELAT DIS

Can nephropathy be improved by bariatric surgery?

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 Studies show that the benefits of bariatric surgery can extend beyond weight loss to include improved glycaemic control in people with T2D.

2 The authors aimed to establish if improved glycaemic control resulting from bariatric surgery would reduce end-organ complications such as diabetic nephropathy (DN).

3 Postoperative outcomes of 52 patients experiencing albuminuria were retrospectively determined 5 years after bariatric surgery. The presence of DN was measured by urinary albumin/creatinine ratio (uACR) before and after bariatric surgery.

4 DN was detected in 37.6% of patients preoperatively. DN had resolved in 58.3% of these patients at a mean follow-up of 66 months (range 60–92) after surgery.

5 Bariatric surgery was associated with T2D remission in 44% of participants, with 33% displaying an improvement in their diabetes status. Mean reductions were observed in fasting glucose (2.0 mmol/L [36.6 mg/dL]) and HbA_{1c} (13.1 mmol/mol [1.2%]), reflecting an amelioration in glycaemic control.

6 Albuminuria developed 5 years after surgery in 25% of patients who did not show signs of DN preoperatively.

7 The authors concluded that bariatric surgery can effectively improve glycaemic control in T2D and resolve or delay the onset of microvascular complications such as DN. They suggest that further follow-up of larger cohorts is warranted.

Heneghan HM, Cetin D, Navaneethan SD et al (2013) Effects of bariatric surgery on diabetic nephropathy after 5 years of follow-up. *Surg Obes Relat Dis* **9**: 7–14

“The authors concluded that diabetes risk is higher in individuals who were obese as adolescents compared to those with adult-onset obesity.”

DIABETES CARE

High-protein diet linked to improved markers of beta-cell function

Readability	✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓✓

1 Obesity is a major risk factor for T2D. Low-carbohydrate and high-protein (HP) diets have been recommended for weight loss but there is great controversy over which diet is most efficacious.

2 The aim of this study was to assess the effects of HP versus high-carbohydrate (HC) diet on beta-cell function in premenopausal women without diabetes.

3 A total of 24 women were randomised to receive either HC (55% carbohydrates, 30% fat, 15% protein) or HP (40% carbohydrates, 30% fat, 30% protein) 500 kcal intake/day restriction diet for 6 months.

4 Women receiving HP displayed greater improvements in markers of inflammatory cytokines TNF-alpha (21.8 versus 20.9 pg/mL; $P < 0.0001$) and IL-6 (21.3 versus 20.4 pg/mL; $P < 0.0001$), lipid peroxidation marker malondialdehyde (20.4 versus 20.2 mmol/L; $P = 0.0004$) and oxidative stress marker dichlorofluorescein (20.8 versus 20.3 mmol/L; $P < 0.0001$).

5 Insulin sensitivity (4 versus 0.9; $P < 0.0001$) and beta-cell function (7.4 versus 2.1; $P < 0.0001$) were also significantly improved in the HP group compared to HC.

6 The authors concluded that HP diets are effective in improving markers of insulin sensitivity and beta-cell function in obese women without diabetes.

Kitabchi AE, McDaniel KA, Wan JY et al (2013) Effects of high-protein versus high-carbohydrate diets on markers of beta-cell function, oxidative stress, lipid peroxidation, proinflammatory cytokines, and adipokines in obese, premenopausal women without diabetes: a randomized controlled trial. *Diabetes Care* 12 Feb [Epub ahead of print]

DIABETES CARE

Obesity during adolescence increases diabetes risk in adult life

Readability	✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓

1 Whilst the association between current obesity and T2D is well established, some research suggests that the incidence of childhood or adolescent obesity may increase diabetes risk in adult life.

2 The authors aimed to determine if early-onset obesity during adolescence or young adulthood increases the risk of diabetes in later life.

3 The US National Longitudinal Study of Adolescent Health followed a cohort of 10 481 ethnically diverse young people aged between 12 and 21 years.

4 A total of 4.4% of participants aged between 24 and 33 years developed diabetes, with half being undiagnosed. A higher prevalence was recorded in Black and Hispanic young people compared to White Caucasian youths.

5 Multivariable analysis revealed that women who were obese at 16 years of age were more likely to have diabetes than women who became obese at 18 years old (odds ratio, 2.77; 95% CI, 1.39–5.52). Persistent obesity, as opposed to adult-onset obesity, was associated with increased risk of diabetes in both men (2.27, 95% CI, 1.41–3.64) and women (2.08, 95% CI, 1.34–3.24).

6 The authors concluded that diabetes risk is higher in individuals who were obese as adolescents compared to those with adult-onset obesity. They argue that their results highlight an urgent need for diabetes prevention to target paediatric obesity

The NS, Richardson AS, Gordon-Larsen P (2012) Timing and duration of obesity in relation to diabetes: Findings from an ethnically diverse, nationally representative sample. *Diabetes Care* 36: 865–72

DIABETES CARE

Weight regain is associated with antidepressant use in people with IGT

Readability	✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓

1 Depression and antidepressant medications have been associated with obesity in individuals with T2D.

2 The authors sought to determine if antidepressant medication use and depression symptoms were predictive of weight regain in a cohort of obese individuals with impaired glucose tolerance (IGT).

3 The Diabetes Prevention Program Outcome Study (DPPOS) followed 1442 successful weight losers taking part in the Diabetes Prevention Program (DPP). Weight and antidepressant medication use were measured every 6 months and depression symptoms were assessed every 12 months using the Beck Depression Inventory.

4 Elevated depression symptoms were reported by 25.6% of participants. At 6 months, participants using antidepressant medication were 72% more likely to regain weight. Selective serotonin reuptake inhibitors were the most commonly used antidepressive therapy (78%).

5 Antidepressant use was a significant predictor of weight regain after adjustment for multiple covariates ($P = 0.0005$ cumulatively), whereas depression symptoms were not predictive of weight gain. After an average of 5.1 years, 57% of weight losers had regained weight.

6 The authors concluded that antidepressant use, but not depression symptoms, were predictive of weight regain in overweight individuals with IGT who were successful initial weight losers.

Price DW, Ma Y, Rubin RR, Perreault L et al (2013) Depression as a predictor of weight regain among successful weight losers in the diabetes prevention program. *Diabetes Care* 36: 216–21