Metabolic changes and diabetes microvascular complications 5 years after bariatric surgery

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BACKGROUND

Bariatric surgery has pronounced effects on the metabolic profile of patients with type 2 diabetes mellitus (T2DM). The American Diabetes Association (ADA) and International Diabetes Federation (IDF) have provided standardised definitions of T2DM remission. Long-term remission rates of T2DM following bariatric surgery according to these criteria and its effects on T2DM microvascular complications remain unknown.

OBJECTIVES

- 1. To assess the rates of T2DM patients achieving the ADA and IDF criteria for T2DM remission 5 years after bariatric surgery.
- 2. To assess the long-term effect of bariatric surgery on albuminuria and retinal appearances in patients with T2DM using direct measures.

METHOD

Clinical data and direct measurements of renal and retinal damage were collected prospectively and analysed retrospectively for 82 patients with T2DM who underwent bariatric surgery (Roux-en-Y gastric bypass, n=59; gastric banding, n=8; vertical sleeve gastrectomy, n=15) in a UK centre of excellence and were followed up for 5 years.

RESULTS

TABLE 2. Pre-operative and 5-year post-operative data from the cohort of patients studied (n=82).

	Pre-operatively	5 years post-operatively	P value
Weight (Kg)	133.5 [113.7 - 150.0] (84.0 - 235.0)	100.4 [82.2 - 115.0] (62.0 - 165.0)	<0.0001
% weight loss	n/a	24.0 ±11.8 (-3.0 - 50.7)	n/a
HbA1c (%)	7.7 [6.7 - 9.3] (5.2 - 12.6)	6.3 [5.6 - 7.2] (5.0 - 9.6)	<0.0001
HbA1c (mmol/mol)	61.0 [50.0 - 78.0] (33.0 - 114.0)	45.0 [38.0 - 55.0] (31.0 - 81.0)	<0.0001
Glucose (mmol/l)	7.1 [5.3 - 9.4] (3.0 - 19.4)	6.0 [5.0 - 8.0] (3.1 - 16.0)	0.0014
Total cholesterol (mmol/l)	4.7 [4.0 - 5.4] (2.1 - 8.8)	4.4 [3.8 - 5.1] (2.0 - 9.1)	0.21
HDL cholesterol (mmol/l)	1.1 [0.9 - 1.3] (0.5 - 2.1)	1.4 [1.2 - 1.6] (0.7 - 2.5)	<0.0001
LDL cholesterol (mmol/l)	2.6 [1.9 - 3.6] (0.4 - 5.2)	2.3 [1.8 - 3.0] (1.0 - 6.2)	0.16
Triglycerides (mmol/l)	1.8 [1.3 - 2.4] (0.6 - 7.4)	1.3 [0.9 - 1.8] (0.4 - 4.4)	<0.0001
Systolic BP (mmHg)	142 [130 - 150] (103 - 195)	128 [120 - 139] (104 - 196)	<0.0001
Diastolic BP (mmHg)	84 [80 - 90] (63 - 114)	76 [70 - 80] (57 - 110)	<0.0001
Glucose lowering medication	2 [1 - 2] (0 - 4)	1 [0 - 1] (0 - 3)	<0.0001
BP lowering medication	1 [0 - 2] (0 - 5)	1 [0 - 2] (0 - 5)	0.48
Lipid lowering medications	1 [0 - 1] (0 - 3)	1 [0 - 1] (0 - 1)	0.86
Hypoglycaemia (%)	n/a	32%	n/a
ACR (mg/mmol)	1.8 [0.8-4.9] (0.2-312.4)	1.2 [0.7-4.3] (0.1-413.4)	0.48
ACR in cohort with albuminuria at baseline, n=62, (mg/mmol)	7.1 [4.6-29.5] (2.9-312.4)	3.6 [0.6-18.1] (0.3-413.4)	0.020

CONCLUSIONS

Bariatric surgery induced a significant sustained improvement of cardio-metabolic risk factors in patients with T2DM, however a relatively low number of patients achieved T2DM remission at 5 years. Whilst the findings on microvascular complications are encouraging, these results raise the hypothesis that concurrent intensive medical therapy may be required to achieve more stringent and optimal cardio-metabolic targets. Such an approach may further reduce the microvascular and macrovascular complications of T2DM.

KEY REFERENCES

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TABLE 1. The American Diabetes Association (ADA) and International Diabetes Federation (IDF) criteria

ADA criteria definitions
Complete remission of Type 2 Diabetes Mellitus
<ul style="list-style-type: none">HbA1c < 42 mmol/mol (6.0%)fasting glucose <5.6 mmol/l (100 mg/dl)at least 1 year’s duration in the absence of active pharmacologic therapy or ongoing procedures.
ADA complete remission >5 years is defined as “cure” of diabetes
Partial remission of Type 2 Diabetes Mellitus
<ul style="list-style-type: none">HbA1c < 48 mmol/mol (6.5%)fasting glucose 5.6-6.9 mmol/l (100-125 mg/dl)at least 1 year’s duration in the absence of active pharmacologic therapy or ongoing procedures
IDF criteria definitions
Optimisation of the metabolic state
<ul style="list-style-type: none">HbA1c ≤ 42 mmol/mol (6.0%)no hypoglycaemiatotal cholesterol < 4.0 mmol/lLDL cholesterol < 2.0 mmol/ltriglycerides < 2.2 mmol/lblood pressure < 135/85 mmHg> 15% weight losswith reduced medication from the pre-operated state or without other medications (where medications are continued, reduced doses from pre-surgery with minimal side effects would be expected)
Substantial improvement of the metabolic state
<ul style="list-style-type: none">lowering of HbA1c by > 20%LDL < 2.3 mmol/lblood pressure < 135/85 mmHgwith reduced medication from the pre-operated state

FIGURE 1. Percentage of patients that met the ADA and IDF criteria (n=82)

At 5 years, 23% and 13% patients achieved complete and partial remission of T2DM based on the ADA criteria respectively; 5% and 10% patients achieved optimisation and improvement of the metabolic state based on the IDF criteria respectively.

FIGURE 2. Retinal appearances pre- and post-operatively (n=24)

In the group of 24 patients with available retinal images, retinal appearances remained stable in 13, worsened in 6 and regressed in 5 patients.