STANDARDS OF MEDICAL CARE IN DIABETES 2017
METABOLIC SURGERY
Surgery recommendations based on BMI and glycemic control

<table>
<thead>
<tr>
<th>BMI (kg/m²) in type 2 diabetes patients</th>
<th>Glycemic control</th>
<th>Surgery guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>40+ (37.5+ in Asian Americans)</td>
<td>Controlled or uncontrolled</td>
<td>Recommended</td>
</tr>
<tr>
<td>35–39.9 (32.5–37.4 in Asian Americans)</td>
<td>Inadequately controlled</td>
<td>Recommended</td>
</tr>
<tr>
<td>30–34.9 (27.5–32.4 in Asian Americans)</td>
<td>Inadequately controlled</td>
<td>Considered</td>
</tr>
</tbody>
</table>
## Treatment for overweight and obesity in type 2 diabetes

<table>
<thead>
<tr>
<th>Treatment</th>
<th>BMI category (kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diet, physical activity, and behavioral therapy</td>
<td>23.0* or 25.0 - 26.9</td>
</tr>
<tr>
<td></td>
<td>27.0 - 29.9</td>
</tr>
<tr>
<td></td>
<td>27.5* or 30.0 - 34.9</td>
</tr>
<tr>
<td></td>
<td>35.0 - 39.9</td>
</tr>
<tr>
<td></td>
<td>≥ 40</td>
</tr>
<tr>
<td>Pharmacotherapy</td>
<td></td>
</tr>
<tr>
<td>Metabolic surgery</td>
<td></td>
</tr>
</tbody>
</table>

Treatment may be indicated for selected motivated patients based on BMI range

*Cutoff points for Asian American individuals
Several gastrointestinal (GI) operations promote dramatic and durable improvement of type 2 diabetes. Given the magnitude and rapidity of the effect of GI surgery on hyperglycemia, and experimental evidence that rearrangements of GI anatomy similar to those in some metabolic procedures directly affect glucose homeostasis, GI interventions have been suggested as treatments for type 2 diabetes, and in that context are termed “metabolic surgery.”

Recommendations

- Metabolic surgery should be recommended to treat type 2 diabetes in appropriate surgical candidates with BMI ≥ 40 kg/m² (BMI ≥ 37.5 kg/m² in Asian Americans), regardless of the level of glycemic control or complexity of glucose-lowering regimens, and in adults with BMI 35.0–39.9 kg/m² (32.5–37.4 kg/m² in Asian Americans) when hyperglycemia is inadequately controlled despite lifestyle and optimal medical therapy.
  Evidence Grading: A (See Appendix for definitions)

- Metabolic surgery should be considered for adults with type 2 diabetes and BMI 30.0–34.9 kg/m² (27.5–32.4 kg/m² in Asian Americans) if hyperglycemia is inadequately controlled despite optimal medical control by either oral or injectable medications (including insulin).
  Evidence Grading: B

- Metabolic surgery should be performed in high-volume centers with multidisciplinary teams that understand and are experienced in the management of diabetes and gastrointestinal surgery.
  Evidence Grading: C

- Long-term lifestyle support and routine monitoring of micronutrient and nutritional status must be provided to patients after surgery, according to guidelines for postoperative management of metabolic surgery by national and international professional societies.
  Evidence Grading: C

- People presenting for metabolic surgery should receive a comprehensive mental health assessment.
  Evidence Grading: B

- Surgery should be postponed in patients with histories of alcohol or substance abuse, significant depression, suicidal ideation, or other mental health conditions until these conditions have been fully addressed.
  Evidence Grading: E

- People who undergo metabolic surgery should be evaluated to assess the need for ongoing mental health services to help them adjust to medical and psychosocial changes after surgery.
  Evidence Grading: C
Clinical Evidence

A substantial body of evidence has now accumulated, including data from numerous randomized controlled clinical trials, demonstrating that metabolic surgery achieves superior glycemic control and reduction of cardiovascular risk factors in obese patients with type 2 diabetes compared with various lifestyle/medical interventions.4

- Improvements in micro- and macro-vascular complications of diabetes, cardiovascular disease, and cancer have been observed only in nonrandomized observational studies.5-12 Cohort studies attempting to match surgical and nonsurgical subjects suggest that the procedure may reduce longer-term mortality.6

- On the basis of this mounting evidence, several organizations and government agencies have recommended expanding the indications for metabolic surgery to include patients with inadequately controlled type 2 diabetes and BMI as low as 30 kg/m² (27.5 kg/m² for Asian Americans).13-16 Please refer to the American Diabetes Association consensus report "Metabolic Surgery in the Treatment Algorithm for Type 2 Diabetes: A Joint Statement by International Diabetes Organizations" for a thorough review.4

- Randomized controlled trials with postoperative follow-up ranging from one to five years have documented sustained diabetes remission in 30–63% of patients.29

- Available data suggest an erosion of diabetes remission over time: 35–50% or more of patients who initially achieve remission of diabetes eventually experience recurrence. However, the median disease-free period among such individuals following Roux-en-Y gastric bypass (RYGB) is 8.3 years.17,18

- With or without diabetes relapse, the majority of patients who undergo surgery maintain substantial improvement of glycemic control from baseline for at least 5 to 15 years.6,7,9,18,20-22

- Younger age, shorter duration of diabetes (e.g., <8 years)23, non-use of insulin, and better glycemic control are consistently associated with higher rates of diabetes remission and/or lower risk of recidivism.6,21,23

- Greater baseline visceral fat area may also help to predict better postoperative outcomes, especially among Asian American patients with type 2 diabetes, who typically have more visceral fat compared with caucasians with diabetes of the same BMI.24

- Beyond improving glycemia, metabolic surgery has been shown to confer additional health benefits in randomized controlled trials, including greater reductions in cardiovascular disease risk factors and enhancements in quality of life.19,23,25

- The safety of metabolic surgery has improved significantly over the past two decades, with continued refinement of minimally invasive approaches (laparoscopic surgery), enhanced training and credentialing, and involvement of multidisciplinary teams.

- Mortality rates with metabolic operations are typically 0.1–0.5%, similar to cholecystectomy or hysterectomy.26-30

- Morbidity has also dramatically declined with laparoscopic approaches. Major complications rates are 2–6%, with minor complications in up to 15%,26-34 comparing favorably with other commonly performed elective operations.30

- Empirical data suggest that proficiency of the operating surgeon is an important factor for determining mortality, complications, reoperations, and readmissions.35

- Although metabolic surgery has been shown to improve the metabolic profiles of morbidly obese patients with type 1 diabetes, establishing the role of metabolic surgery in such patients will require larger and longer studies.36

- Retrospective analyses and modeling studies suggest that metabolic surgery may be cost-effective or even cost-saving for patients with type 2 diabetes, but the results are largely dependent on assumptions about the long-term effectiveness and safety of the procedures.37,38
Adverse Effects

- Metabolic surgery is costly and has associated risks. Longer-term concerns include dumping syndrome (nausea, colic, diarrhea), vitamin and mineral deficiencies anemia, osteoporosis, and, rarely, severe hypoglycemia from insulin hypersecretion. 39

- Long-term nutritional and micronutrient deficiencies and related complications occur with variable frequency depending on the type of procedure and require lifelong vitamin/ nutritional supplementation. 40,41

- Postprandial hypoglycemia is most likely to occur with RYGB. 40,41 The exact prevalence of symptomatic hypoglycemia is unknown. In one study, it affected 11% of 450 patients who had undergone RYGB or vertical sleeve gastrectomy. 42

- Patients who undergo metabolic surgery may be at increased risk for substance use, including drug and alcohol use and cigarette smoking. 43

- People with diabetes presenting for metabolic surgery also have increased rates of depression and other major psychiatric disorders. 44

- Candidates for metabolic surgery with histories of alcohol or substance abuse, significant depression, suicidal ideation, or other mental health conditions should therefore first be assessed by a mental health professional with expertise in obesity management prior to consideration for surgery. 45

- Individuals with preoperative psychopathology should be assessed regularly following metabolic surgery to optimize mental health management and to ensure psychiatric symptoms do not interfere with weight loss and lifestyle changes.
References

Appendix: Evidence grading system

The following grading system was developed by the ADA to clarify and codify evidence that forms the basis of recommendations.

A. Clear evidence from well-conducted, generalizable randomized controlled trials that are adequately powered.
B. Supportive evidence from well-conducted cohort or case control studies.
C. Supportive evidence from poorly controlled or uncontrolled studies.
D. Expert consensus or clinical experience.

Adopted verbatim from: “American Diabetes Association Standards of Medical Care in Diabetes Care 2017” Diabetes Care 2017; 40 (Suppl. 1):S1–S2. DOI: 10.2337/dc17-S001. Available at: http://care.diabetesjournals.org/content/40/Supplement_1