Published in final edited form as:

JAMA. 2017 February 14; 317(6): 635–636. doi:10.1001/jama.2016.20563.

Metabolic Surgery in the Treatment Algorithm for Type 2 Diabetes:

A Joint Statement by International Diabetes Organizations

Juan P. Brito, MD, MSc, **Victor M. Montori, MD, MSc**, and **Andrew M. Davis, MD, MPH**
Mayo Clinic, Rochester, Minnesota (Brito); Knowledge and Evaluation Research Unit, Mayo Clinic, Rochester, Minnesota (Montori); Section of General Internal Medicine, University of Chicago, Chicago, Illinois (Davis)

Summary of the Clinical Problems

Type 2 diabetes affects 12% to 14% of persons in the United States, with prevalence rates exceeding 20% in non-Hispanic black, Asian, and Hispanic populations.[1] Pharmaceutical and behavioral approaches to restore glucose homeostasis and to avoid long-term complications of diabetes may be effective, but sustaining adherence is often difficult.[2] Gastrointestinal operations (Roux-en-Y gastric bypass, vertical sleeve gastrectomy, laparoscopic adjustable gastric banding, and biliopancreatic diversion) provide substantial weight loss and often improve function and reduce obesity-related complications.[3] Some consider bariatric interventions as metabolic surgeries when the goal is to improve metabolic health rather than weight alone, and these procedures can lead to changes in the gut microbiome and hormones, bile acid metabolism, and other factors that affect glucose homeostasis independent of weight loss.[4] Recent studies and an emerging consensus suggest metabolic surgery to treat T2D in some patients. However, a firm link between controlling diabetes through metabolic surgery and preventing diabetes complications has yet to be established.

Characteristics of the Guideline Source

This guideline was published by delegates of the Second Diabetes Surgery Summit (DSS-II), an international consensus conference organized in collaboration with major diabetes organizations (Table).[4] The DSS-II organizing committee tasked 48 academic experts (75% nonsurgeons) with unclear relevant financial relationships to write a guideline for the surgical treatment of T2D. Prior to meeting, delegates received an evidence summary and the proposed recommendations. They used an interactive feedback process to reach agreement (≥67%). Consensus recommendations were presented at the Third World

Corresponding Author: Andrew M. Davis, MD, MPH, Section of General Internal Medicine, University of Chicago, 4124 N LeClaire Ave, Chicago, IL (adavis@medicine.bsd.uchicago.edu).

DEVELOPER Second Diabetes Surgery Summit

TARGET POPULATION Patients with type 2 diabetes (T2D)

Conflict of Interest Disclosures: The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

Congress on Interventional Therapies for Type 2 Diabetes for comment and electronic voting. Delegates then met face to face to develop a final consensus document.

Evidence Base

The evidence to achieve glycemic end points, durability, perioperative safety, reduction of cardiovascular risk factors, and the economic implications of metabolic surgery was summarized by collecting randomized clinical trials (RCTs) and observational studies in MEDLINE reporting the effects of metabolic surgery in patients with diabetes. Conclusions from these studies were graded IA to IV based on study design. Meta-analyses of RCTs were rated as IA regardless of the risk of bias, directness, precision, or inconsistency in results of included trials. Nonsystematic clinical observations were rated as IV. Recommendations were formulated based on graded conclusions but did not make explicit the factors considered in formulating the recommendation or grade the strength of each recommendation. The authors did not provide detailed methods regarding how the evidence document was generated.

Benefits and Harms

For patients with T2D, 15 RCTs compared metabolic surgery vs medical/lifestyle intervention, noting that there was substantial heterogeneity between trials, with few using the same end points. Metabolic surgery was more effective than medical/lifestyle intervention to achieve glycemic control (eg, hemoglobin A_{1c}[HbA_{1c}] ≤6.5%) or diabetes remission (achieving nondiabetic HbA_{1c} levels), with an odds ratio of 8.5 (95% CI, 6.4–11.1), which translates into a number needed to treat of 3. Type 2 diabetes remission rates are significantly lower when a stricter definition is applied (HbA_{1c} <5.7%) or when diabetes has been present for 8 years or longer.[4] The median HbA_{1c} reduction was 2% for surgery vs 0.5% for medical/lifestyle intervention. This estimate was consistent across BMI subgroups (mean BMI ≤35 or >35) and follow-up (1–5 years). Observational studies with longer follow-up have shown that about 50% of patients who initially achieve diabetes remission eventually experience recurrence, though medication burden is typically reduced after surgery. Imprecise estimates from few RCTs suggest benefits in cardiovascular risk factors and quality of life. Imprecise estimates from a few RCTs suggest improvements in cardiovascular risk factors and quality of life, and some observational studies suggest that bariatric surgery may reduce microvascular and macrovascular diabetes complications.[4,5] These benefits have not been confirmed by RCTs. One modeling analysis estimated that the cost per quality-adjusted life-year (QALY) of bariatric surgery in patients with T2D is $3200 to $6300 (with $50000/QALY deemed appropriate for coverage).[4] In contrast, direct health care savings from metabolic surgery have not been observed in clinical studies, nor have randomized trials compared the effectiveness and safety of surgery with conventional treatment in adolescents.

The harms of bariatric/metabolic surgery depend on the proficiency of the operating surgeon and perioperative and surgical teams and on the type of intervention. After surgery, long-term nutrition and micronutrient deficiency is frequent (eg, iron deficiency); the effect of surgery on the risk of hypoglycemia or bone fractures remains unclear. Overall, the mortality

rate with metabolic surgery is 0.1% to 0.5%, the rate of major complications 2% to 6%, and minor complications up to 15% ; the rate of reoperations or revisions ranges from 0.6% to 20% over 5 to 10 years.[3,4]

Discussion

Bariatric surgery is effective for patients with T2D but is invasive and has risks, and its effects often wane over time. Restrictive procedures (gastric ring or sleeve) may be less effective than Roux-en-Y gastric bypass or biliary pancreatic diversion. The best data on the long-term effects of bariatric surgery, a 10-year VA cohort study[6] and a prospective 15-year study,[7] documented long-term mean weight losses of 13% to 26% from various procedures, but the latter study found no overall effect on total health care costs in patients with T2D. Which treatment (lifestyle and psychosocial interventions, medications, or surgery) alone or in combination is best for a given patient cannot be decided only from the effect on metabolic measures (BMI and HbA_{1c}), and incorporating meaningful shared decision making with patients is essential.[8] The consensus guideline recommends considering surgery for patients with T2D, particularly those with severe obesity, and advances the field by providing guidance for preoperative evaluation and postoperative follow-up.

Areas in Need of Future Study or Ongoing Research

Several large retrospective studies and smaller prospective trials are under way to confirm the long-term effect of bariatric surgery on microvascular and macrovascular outcomes.[5] High-quality RCTs are needed to elucidate the role of bariatric surgery after considering factors such as the baseline duration of diabetes, presence of complications, and preoperative level of glycemic control, and in patients with lower BMI and of Asian-Pacific heritage. Comparative effectiveness research among the surgical and emerging endoscopic interventions will help establish their relative merits across populations. A better understanding of the mechanisms of weight loss and improved glucose metabolism may help with choice among procedures and perhaps uncover new diabetes interventions. Metabolic surgeries also pose challenges to the health care delivery system. Relatively few US centers may be able offer procedures with efficacy and outcomes similar or better to those observed in clinical trials. Registries to facilitate perioperative and long-term nutritional follow-up and track outcomes are crucial. Insurance policies may impair access to such centers and may exacerbate disparities.[9] Patients with T2D and their clinicians may benefit from evidence-based decision tools when discussing treatment options. These discussions should address the relative value of each pertinent approach (eg, lifestyle interventions, medical therapies, metabolic surgery) and how each might contribute to the patient burden of treatment.[10]

Acknowledgments

FUNDING SOURCE Nonprofit and for-profit organizations

References

1. Menke A, Casagrande S, Geiss L, Cowie CC. Prevalence of and trends in diabetes among adults in the United States, 1988–2012. JAMA. 2015; 314(10):1021–1029. [PubMed: 26348752]

2. García-Pérez L-E, Alvarez M, Dilla T, et al. Adherence to therapies in patients with type 2 diabetes. Diabetes Ther. 2013; 4(2):175–194. [PubMed: 23990497]
3. Chang SH, Stoll CR, Song J, et al. The effectiveness and risks of bariatric surgery. JAMA Surg. 2014; 149(3):275–287. [PubMed: 24352617]
4. Rubino F, Nathan DM, Eckel RH, et al. Metabolic surgery in the treatment algorithm for type 2 diabetes. Diabetes Care. 2016; 39(6):861–877. [PubMed: 27222544]
5. Adams TD, Arterburn DE, Nathan DM, Eckel RH. Clinical outcomes of metabolic surgery. Diabetes Care. 2016; 39(6):912–923. [PubMed: 27222549]
6. Maciejewski ML, Arterburn DE, Van Scoyoc L, et al. Bariatric surgery and long-term durability of weight loss. JAMA Surg. 2016; 151(11):1046–1055. [PubMed: 27579793]
7. Keating C, Neovius M, Sjöholm K, et al. Health-care costs over 15 years after bariatric surgery for patients with different baseline glucose status. Lancet Diabetes Endocrinol. 2015; 3(11):855–865. [PubMed: 26386667]
8. Hargraves I, LeBlanc A, Shah ND, Montori VM. Shared decision making. Health Aff (Millwood). 2016; 35(4):627–629. [PubMed: 27044962]
9. Lewis KH, Edwards-Hampton SA, Ard JD. Disparities in treatment uptake and outcomes of patients with obesity in the USA. Curr Obes Rep. 2016; 5(2):282–290. [PubMed: 27023070]
10. Tran VT, Barnes C, Montori VM, et al. Taxonomy of the burden of treatment. BMC Med. 2015; 13:115. [PubMed: 25971838]

MAJOR RECOMMENDATIONS

Metabolic surgery is recommended as an option to T2D in patients with class III obesity (body mass index [BMI] ≥40) regardless of glycemic control or complexity of glucose-lowering regimens and in patients with class II obesity (BMI 35.0–39.9) with inadequately controlled hyperglycemia despite lifestyle and optimal medical therapy. Metabolic surgery should also be considered to treat T2D in patients with class I obesity (BMI 30.0–34.9) and inadequately controlled hyperglycemia despite optimal medical treatment by oral or injectable medications (including insulin). Metabolic surgery should be performed in high-volume centers with multidisciplinary teams that are experienced in the management of diabetes and gastrointestinal surgery.

Table

Guideline Rating

Standard	Rating
Establishing transparency	Fair
Management of conflict of interest in the guideline development group	Poor
Guideline development group composition	Fair
Clinical practice guideline–systematic review intersection	Fair
Establishing evidence foundations and rating strength for each of the guideline recommendations	Poor
Articulation of recommendations	Fair
External review	Fair
Updating	Fair
Implementation issues	Poor