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The Current Practice of Metabolic Surgery for the Treatment of Type 2 Diabetes Mellitus

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One of the major milestones achieved for bariatric and metabolic surgery community is the endorsement of metabolic surgery as a treatment of diabetes mellitus type 2 (T2DM) in overweight and obese patients. The new American diabetes association (ADA) standard of medical care in diabetes – 2017 recommends metabolic surgery for patients with T2DM and a body mass index (BMI) $\geq$ 40 kg/m^2 regardless of glycemic control. In the same regards, metabolic surgery is also recommended for adult patients with BMI range of 35.0 - 39.9 kg/m^2 when hyperglycemia is not controlled despite optimal medical therapy. It is important to keep in mind that certain populations like Asians have lower threshold for T2DM with lower BMI. Thus, lowering the range of BMI by 2.5 kg/m^2 for each category. Additionally, metabolic surgery should be recommended for adults with T2DM and BMI 30.0 - 34.9 kg/m^2 (27.5 - 32.4 kg/m^2 in Asians) if hyperglycemia is inadequately controlled despite optimal medical therapy, including the use of insulin or other injectable anti-diabetic medications (1).

The dramatic blood sugar control soon after a weight loss surgery has changed the concept of bariatric surgery from a weight loss surgery to metabolic surgery. It has been noticed that the metabolic effect, especially blood sugar control, is evident even before patient loses significant weight. The complex mechanism of the metabolic effect of bariatric surgery and glucose homeostasis is under extensive investigation.

In a meta-analysis reporting the metabolic effect of bariatric surgery concluded a 77% remission rate for T2DM, defined by persistent normal blood sugar without the use of medication. While 86% of patients had improvement of diabetes control. The metabolic effect of weight loss surgery extends to other comorbidities resolution such as hyperlipidemia and hypertension. In the same study, hyperlipidemia improved in 70% or more of patients, while hypertension was resolved in 61.7% of patients and resolved or improved in 78.5% (2). A higher level of evidence, corresponding to randomized controlled trial comparing metabolic surgery and medical therapy, are now available in the literature. Mingrone et al. compared the efficacy of medical therapy to metabolic surgery in control of T2DM in 60 patients. T2DM remission was defined as fasting glucose level below 100 mg/dL and HbA1C level below 6.5%. Metabolic surgery included either Roux-en-Y gastric bypass (RYGB) or biliopancreatic diversion with duodenal switch (BPD/DS). At 2 years follow up, the rate of diabetes remission was 0%, 75%, and 95% for medical therapy, RYGB and BPD/DS respectively (3). The same group updated their results at 5-year follow up and concluded that 50% of the surgical group maintained remission of T2DM (4). Schauer et al. randomized 150 patient with known uncontrolled DM to either medical therapy, RYGB, or sleeve gastrectomy. The BMI range was from 27 to 43 kg/m^2. At 3-year follow up, the end outcome was HbA1C below 6%, with or without diabetes medications. The study concluded DM resolution in 5%, 38%, and 24 % for patients in the medical-therapy, RYGB, and sleeve-gastrectomy group receptively (5). To further emphasize the role of metabolic surgery separately from weight loss, metabolic surgery has been studied on diabetic patients with low BMI, ranging from 30 to 35 kg/m^2. The metabolic outcome revealed significant control of blood sugar or complete remission of DM in multiple retrospective studies, even in patients with long standing DM (6-9).

Obesity has been recognized as a disease in 2013 by the American Medical Association. The substantial increase in incidence and prevalence of obesity and its related diseases is alarming. The World Health Organization (WHO) estimates 1.4 billion adults who are overweight (BMI above or equal to 30 kg/m^2). The current estimate that one third of world's population are either overweight or obese (10). Side by side, the prevalence of T2DM in the world was 415 million patients in 2015. The international diabetes federation which publishes the world diabetes map shows an increase in the diabetes incidence among countries whose obesity rate is increasing. The Mediterranean countries are challenged with an escalating concern for the increasing

number of obesity and diabetes. In the presence of guidelines that recommend metabolic surgery for the treatment of diabetes and obesity (1), every effort should be done to adopt a complete strategy against obesity. Nonetheless, there is more work to be done to expand the knowledge and understanding of metabolic surgery and broaden the awareness of weight loss in addition to what have already been accomplished. The teamwork between primary care physicians, internists, endocrinologists, nutritionists and bariatric surgeons along with other healthcare providers should support the culture of metabolic surgery in combating T2DM and obesity. It is equally important to emphasize the need for appropriately trained surgeons in the field of bariatric and metabolic surgery and the existence of high-volume centers capable to support multidisciplinary teams for metabolic and bariatric surgery.

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