Commentary

# Advances in Bariatric and Metabolic Surgery

Shanker Pasupathy, [1,2]*FRCS (Glasgow), FRCS(Edinburgh), FAMS*

Bariatric surgery is the euphemistic name for the surgical treatment of severe or morbid obesity.[1] Weight loss is induced by 2 main mechanisms. The first mechanism is restriction of the stomach, effected either by placement of a band to narrow the gastric inlet (think of a choker necklace) or by removing part of the stomach to limit its capacity. The second mechanism is reduced nutrient absorption; a gastro-intestinal bypass is created such that there is less surface area and contact time between food and intestine. These mechanisms are represented today in the 3 most widely accepted procedures—laparoscopic adjustable gastric banding (LAGB), laparoscopic sleeve gastrectomy (LSG) and Roux-en-Y gastric bypass (RYGB).

Emerging in the post-world war II economic boom, bariatric surgery was largely unregulated and very much a fringe discipline in the early years. However, recognition of truncal obesity as a contributor to a conglomeration of risk factors leading to increased cardiovascular risk (now called the metabolic syndrome) put obesity on the radar of health authorities.[2] The availability of standardised operative procedures which produced significant and long-term weight loss led the National Institutes of Health (NIH) to publish guidelines on the indications for bariatric surgery in 1991.[3] Several events soon converged to allow bariatric surgery to grow into an independent specialty.

The first was the advent of laparoscopy. In 1993, the first laparoscopic gastric bypass was performed by Alan Wittgrove in the USA.[4] At the same time, the first gastric bands were placed by laparoscopy in both Europe and Australia.[5,6] The laparoscopic approach was shown to be safer than open surgery.[7] Hospital length of stay and major complication rates were consistently lower after laparoscopic surgery. However, there was an important caveat. Surgeons needed training in this new type of surgery to be good at it. The concept of the "learning curve" was born.[8] It was important to acquire good skills, and spend enough time to gain adequate experience before one could operate independently with consistently good results.

The second was the recognition that obesity-related medical conditions improved dramatically after bariatric surgery. In particular, type 2 diabetes mellitus (T2DM) appeared to be "cured" after gastric bypass up to 80% of the time.[9] Improvement was also noted in the control of blood pressure and cholesterol. These results were momentous and provided real medical (and survival) benefit to many obese patients who otherwise had a dismal future and limited treatment options. In the USA, the national society eventually changed its name to the American Society of Metabolic and Bariatric Surgery (ASMBS) to fully describe the new spectrum of weight loss surgery.

The third was the change in obesity patterns worldwide: no more is obesity a problem of the Western world. With developing countries registering rapidly rising obesity rates, over-nutrition overtook under-nutrition in terms of health impact.[10] Obesity is today well and truly a pandemic. In tandem with the rise in obesity comes the demand for its treatment. However as with all diseases, there is a wide variation in patterns of obesity and the medical implications thereof in different ethnic groups and different environments. For example, for each kilogramme of body weight, Asians have more body fat—and visceral fat in particular—compared to Caucasians.[11]

The last but most significant transformation of recent times is that both society at large and medical professionals, who in general are rather conservative, acknowledge that obesity requires serious attention. Much debate has sprung up in the past year after the American Medical Association declared obesity to be a disease.[12] Whether the 'disease' label is appropriate or not, there is little doubt that leaving obesity untreated in individuals with serious obesity-related conditions such as T2DM, is tantamount to disregarding the 'elephant in the room'. Perhaps the perceived reluctance on the part of endocrinologists and internists to address this obvious target has emboldened bariatric surgeons to enter the war on diabetes.[13]

## Safety and Weight-loss Outcomes

The largest meta-analysis addressing the risks of bariatric surgery to date including 161,756 patients reported

[1]Department of Vascular Surgery, Singapore General Hospital, Singapore
[2]Department of Upper GI and Bariatric Surgery, Singapore General Hospital, Singapore
Address for Correspondence: Dr Shanker Pasupathy, Department of Upper GI and Bariatric Surgery, Singapore General Hospital, Outram Road, Singapore 169608.
Email: shanker.pasupathy@sgh.com.sg

perioperative morbidity of 10% to 17% and 30-day mortality rates of 0.08% to 0.35%.[14] Re-operation rates ranged from 3% to 12%. The lowest number of early complications, but also highest re-operation rates, were noted after LAGB. Many physicians are concerned about referring patients for bariatric surgery because of the risks involved, but analysis of data from the prospective matched cohort Swedish obese subjects study points towards a long-term reduction in overall mortality with an adjusted hazard ratio of 0.71, associated with a significant reduction in cardiovascular and cancer related deaths in the surgical cohort compared to matched obese control subjects receiving usual care.[15]

The multi-centre LABS-2 study group recently published detailed post-surgery weight loss outcomes up to 3 years, demonstrating a wide variation in individuals undergoing the same procedure.[16] Although median weight loss at 3 years was 15.9% following LAGB and 31.5% after RYGB, closer examination of subjects' individual data points demonstrated a marked heterogeneity. The majority of subjects in the LAGB group (62%) experienced initial rapid weight loss in the first 6 months, then a gradual weight loss until 2 years, after which the curve remains rather flat. This is in contrast to 76% of RYGB subjects who experienced rapid weight loss in the first 1 year, gradual weight loss in the second year and then small weight regain between years 2 and 3. Interestingly, the Look AHEAD study which compared standard diabetes support and education with intensive lifestyle intervention (ILI) in 5145 overweight/obese adults with T2DM reported similar weight loss trajectories in the ILI arm. Mean weight loss was 4.7% at the 8-year time point, but analysis of the data revealed that 26% of the cohort did not lose any weight (and possibly gained some), whilst 27% of subjects lost more than 10% of their initial weight.[17]

Such a diverse spread of results might prompt one to ask the question: does the patient fail the treatment or the treatment fail the patient? The answer is not immediately obvious, but the take home message is that weight-loss interventions must be appropriately individualised or potentially be doomed from early on.

## Metabolic Benefits

Earlier sensational reports regarding the reversal and cure of diabetes following bariatric surgery have been somewhat mollified by the solid evidence from several carefully designed prospective studies and randomised controlled trials. Clearly bariatric surgery is a powerful addition to the therapeutic armamentarium for T2DM. Even in poorly controlled T2DM, 42% to 75% of patients may achieve normo-glycaemia in the 12 months following gastric bypass, without any additional medical therapy.[18-20] Reduction in (visceral?) fat mass and the consequent improvement in insulin resistance is the presently accepted rationale, although alterations in incretin hormones, bile acids and microbiota provide exciting avenues for research.

These stunning results have drawn the attention of physicians to now seriously consider a surgical option for their obese diabetic patients.[21] On the other hand, overzealous surgeons clamouring for a surgery-first approach for "diabesity" may be putting the cart before the horse.[22] The importance of eating correctly and increasing physical activity in obese individuals cannot be overemphasized. Remarkable as the improvement in glycaemic control is, a cure for T2DM is terribly elusive and such claims may be potentially misleading. A significant proportion of patients are likely to relapse in the long term,[15] thereby necessitating the involvement of a diabetes physician and lifelong follow-up for all patients.

Bariatric and metabolic surgery today is in primetime. Recent data has shown clearly the benefits and dangers of this radical treatment. Much research is currently underway to delineate the weight-related and weight-independent effects of bariatric surgery. Physiological alterations induced by bariatric surgery mirror the effect of incretin-based therapies for T2DM. Perhaps in the coming years more effective drug treatments may mimic the drastic power of bariatric surgery and obviate the need to unsheathe the knife. Till then, bariatric surgery remains a vital treatment for obesity.

REFERENCES

1. DeMaria EJ. Bariatric surgery for morbid obesity. N Engl J Med 2007;356:2176-83.
2. Reaven G. Metabolic syndrome: pathophysiology and implications for management of cardiovascular disease. Circulation 2002;106:286-8.
3. Gastrointestinal surgery for severe obesity: National Institutes of Health Consensus Development Conference Statement. Am J Clin Nutr 1992;55(2 Suppl):615S-9S.
4. Wittgrove AC, Clark GW, Tremblay LJ. Laparoscopic gastric bypass, Roux-en-Y: Preliminary report of five cases. Obes Surg 1994;4:353-7.
5. Favretti F, Cadiere GB, Segato G, Bruyns G, De Marchi F, Himpens J, et al. Laparoscopic adjustable silicone gastric banding: Technique and results. Obes Surg 1995;5:364-71.
6. O'Brien PE, MacDonald L, Anderson M, Brennan L, Brown WA. Long-term outcomes after bariatric surgery: fifteen-year follow-up of adjustable gastric banding and a systematic review of the bariatric surgical literature. Ann Surg 2013;257:87-94.
7. Hutter MM, Randall S, Khuri SF, Henderson WG, Abbott WM, Warshaw AL. Laparoscopic versus open gastric bypass for morbid obesity: a multicenter, prospective, risk-adjusted analysis from the National Surgical Quality Improvement Program. Ann Surg 2006;243:657-62.

8. Shikora SA, Kim JJ, Tarnoff ME, Raskin E, Shore R. Laparoscopic Roux-en-Y gastric bypass: results and learning curve of a high-volume academic program. Arch Surg 2005;140:362-7.
9. Pories WJ, Swanson MS, MacDonald KG, Long SB, Morris PG, Brown BM, et al. Who would have thought it? An operation proves to be the most effective therapy for adult-onset diabetes mellitus. Ann Surg 1995;222:339-50.
10. Prentice AM. The emerging epidemic of obesity in developing countries. Int J Epidemiol 2006;35:93-9.
11. Deurenberg-Yap M, Chew SK, Deurenberg P. Elevated body fat percentage and cardiovascular risks at low body mass index levels among Singaporean Chinese, Malays and Indians. Obes Rev 2002;3:209-15.
12. American Medical Association House of Delegates. Available at: http://media.npr.org/documents/2013/jun/ama-resolution-obesity.pdf. Accessed 6 March 2014.
13. Buchwald H, Scopinaro N. An invitation to our medical colleagues: Work with us. Obesity Surgery 2010 (20):1465-67.
14. Chang SH, Stoll CR, Song J, Varela JE, Eagon CJ, Colditz GA. The effectiveness and risks of bariatric surgery: An updated systematic review and meta-analysis, 2003-2012. JAMA Surg 2013 Dec 18. doi: 10.1001/jamasurg.2013.3654. [Epub ahead of print].
15. Sjöström L, Lindroos AK, Peltonen M, Torgerson J, Bouchard C, Carlsson B, et al; Swedish Obese Subjects Study Scientific Group. Lifestyle, diabetes, and cardiovascular risk factors 10 years after bariatric surgery. N Engl J Med 2004;351:2683-93.
16. Courcoulas AP, Christian NJ, Belle SH, Berk PD, Flum DR, Garcia L, et al; Longitudinal Assessment of Bariatric Surgery (LABS) Consortium. Weight change and health outcomes at 3 years after bariatric surgery among individuals with severe obesity. JAMA 2013;310:2416-25.
17. Look AHEAD Research Group. Eight-year weight losses with an intensive lifestyle intervention: The look AHEAD study. Obesity (Silver Spring) 2014;22:5-13.
18. Schauer PR, Kashyap SR, Wolski K, Brethauer SA, Kirwan JP, Pothier CE, et al. Bariatric surgery versus intensive medical therapy in obese patients with diabetes. N Engl J Med 2012;366:1567-76.
19. Mingrone G, Panunzi S, De Gaetano A, Guidone C, Iaconelli A, Leccesi L, et al. Bariatric surgery versus conventional medical therapy for type 2 diabetes. N Engl J Med 2012;366:1577-85.
20. Ikramuddin S, Korner J, Lee WJ, Connett JE, Inabnet WB, Billington CJ, et al. Roux-en-Y gastric bypass vs intensive medical management for the control of type 2 diabetes, hypertension, and hyperlipidemia: the Diabetes Surgery Study randomized clinical trial. JAMA 2013;309:2240-9.
21. Dixon JB, Zimmet P, Alberti KG, Rubino F; International Diabetes Federation Taskforce on Epidemiology and Prevention. Bariatric surgery: an IDF statement for obese Type 2 diabetes. Diabet Med 2011;28:628-42.
22. Brethauer SA, Aminian A, Romero-Talamás H, Batayyah E, Mackey J, Kennedy L, et al. Can diabetes be surgically cured? Long-term metabolic effects of bariatric surgery in obese patients with type 2 diabetes mellitus. Ann Surg 2013;258:628-36.