Informed Decision-Making for Bariatric Surgery: Benefits, Risks, Uncertainties and Choices

Abeezar I. Sarela

Received: 2 May 2014 / Accepted: 12 May 2014 / Published online: 6 June 2014
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Abstract Decision-making is a critical aspect of good surgical care, and this principle is particularly important in bariatric surgery. Adequate communication of information to patients is essential in order to facilitate optimal uptake of bariatric surgery and choice of the most suitable procedure. This article reviews the most relevant advances in understanding of long-term efficacy associated with gastric banding, gastric bypass and sleeve gastrectomy.

Keywords Decision-making · Bariatric surgery · Sleeve gastrectomy · Gastric band · Gastric bypass · Metabolic surgery · Type 2 diabetes mellitus

Introduction

Over the past decade, the discipline of bariatric (Greek *baros*, meaning “weight”) surgery has moved from the margins of general surgery to mainstream practice. The history of bariatric surgery begins with truly malabsorptive operations: early descriptions of end-to-end jejunostomy with ileo-caecostomy in the 1950s evolved, by the late 1960s, into the classic end-to-side jejunostomy (JIB), which remained the mainstay for almost 20 years. Presently, the bilio-pancreatic diversion (BPD) procedure, and its mainly laparoscopic variant of vertical gastric resection or sleeve gastrectomy (SG) with duodenal switch (DS), is the only, sparingly used malabsorptive procedure. The forerunner of the present day workhorse of bariatric surgery—the Roux-en-Y gastric bypass (RYGB; Fig. 1)—was gastric

transection with loop gastrojejunostomy (1967), which underwent sequential modifications, leading to the first laparoscopic RYGB (LRYGB) in 1994. In parallel, a restrictive operation—the vertical banded gastroplasty (VBG)—was developed in the 1980s and promoted the concept of laparoscopic placement of an adjustable gastric band (LAGB; first described in 1993; Fig. 2), which has recently overtaken the bypass as the most frequently performed bariatric operation in the USA. Finally, the stand-alone laparoscopic sleeve gastrectomy (LSG; Fig. 3), first performed in the early 2000s, is believed to have arisen from the concept of long vertical gastric stapling espoused by the Magenstrasse (German: *street of the stomach*) and Mill (*of the antrum*) operation, which was devised in the late 1980s.

As the practice of bariatric surgery expanded, it became apparent that weight loss could be regarded as only a surrogate marker of benefit; the overriding benefit was, in fact, treatment of and protection from the constellation of disorders that comprised the metabolic syndrome, which predicts the risk of cardiovascular disease. In order to reflect the expanded scope of the discipline, it is now more accurately named as metabolic and bariatric surgery. Recent, high-quality, randomized clinical trials confirm that bariatric surgery should be an integral part of the care pathway for obese diabetic patients [1, 2].

Despite the explosion in evidence and media publicity, data remain scarce on three vital issues: duration of remission of weight-loss and obesity-related diseases, long-term risk for re-operation and long-term metabolic side effects of surgery. Dearth of such information impedes both, an informed patient decision about whether to have bariatric surgery and informed selection of a bariatric procedure—there is no clearly right or wrong choice—and promotes myth, misinformation and anecdote-based practice in the current age of evidence-based medicine.

The aim of this article is to synthesize and place into perspective recent evidence on outcomes from bariatric

A. I. Sarela (✉)
St. James's University Hospital, Leeds, UK
e-mail: a.sarela@leeds.ac.uk

A. I. Sarela
University of Leeds School of Law, Leeds, UK

Fig. 1 Gastric bypass

surgery in terms of benefits, limitations and potential complications that may aid informed decision-making. The 2009 Cochrane review on surgery for obesity [3] was used as an anchor for accrued and accepted evidence; selected papers from a PubMed search for 2009–2013 were used to prepare the present article.

Does Bariatric Surgery Provide Sustained Weight Control?

A widely referenced source is the Swedish Obese Patients Study (SOS), which has resulted in several, high-impact publications [4–7]. The SOS is a nonrandomized study but is given credence because of detailed, prospective data collection and case-matching of about 2,000 obese patients who had bariatric surgery with a similar number who had conventional medical treatment. It is pertinent to note that the majority (68 %) of SOS patients had VBG; 19 % had banding and 13 % had gastric bypass. Notwithstanding, the SOS conclusions remain valid and, in fact, are likely understated, given

recent data on long-term superiority of gastric bypass over VBG [8].

With respect to the gastric bypass patients in the SOS study, maximum weight loss (32 % of the initial, actual weight) was noted at 2 years postoperatively and 25 % loss was maintained at 10 years [5]. No other single study reports 10-year results with the rigour of the SOS; however, a recent meta-analysis of pooled data does confirm that weight loss from Roux-en-Y gastric bypass is maintained long-term [9]. There has been interest in improving the efficacy of the bypass by application of a prosthesis around the anastomosis (“banded gastric bypass”) but current data are conflicting [10, 11]. Finally, it appears quite clear that both weight loss and disease remission from gastric bypass are inferior to those from BPD with DS [12, 13]; these benefits must be balanced with the greater technical demands, intense nutritional follow-up and potential for serious metabolic complications that are inherent to the DS.

For gastric banding, the SOS reports actual weight loss of 20 % at 2 years, with maintenance of 14 % loss at 10 years [5]. The group from Monash University in Melbourne, Australia, recently reported data on over 3,000 patients, with mean BMI

Fig. 2 Gastric band

of 44 kg/m², who had LAGB between 1994 and 2011. About 700 had completed at least 10-year follow-up, and there was maintenance of 47 % excess weight loss for all patients at or beyond 10 years. These data are put into perspective by a systematic review that places excess weight loss from gastric bypass at 54 % at 10 years [14]. The Monash data are admirable but must be applied with caution by centres that do not have a programme for rigorous follow-up and patient support. Outside of Australia, there is accumulating evidence that weight loss from gastric bypass is superior to that from banding [15]; inevitably, there is a trade-off between the benefit of weight loss and disease resolution with the potential for perioperative and long-term complications and it behoves a mature surgeon to approach this decision-making process with equipoise.

Long-term follow-up data for the stand-alone sleeve gastrectomy are sparse; this is not surprising given that this operation rose to popularity in only the mid to late 2000s. The most recent position statement on the LSG from the American Society of Metabolic & Bariatric Surgery identifies only one paper that reports follow-up up to 9 years: in this small series, only 55 % of patients had retained greater than 50 % excess weight loss from the LSG as a stand-alone procedure [16]. Reliance on randomized controlled trials of sleeve gastrectomy versus gastric bypass is limited by small numbers of participants, short follow-up and conflicting

conclusions [17–19]. An instructive and intuitively realistic current perspective is obtained from the American College of Surgeons Bariatric Surgery Center Network data on about 28,000 patients: the morbidity and the effectiveness of the LSG are positioned somewhere in between those for the LAGB and LRYGB [20]. The college data are corroborated by a subsequent report from the Michigan Bariatric Surgery Collaborative: in a matched cohort study of 3,000 patients each with LAGB, LSG or LRGYB, there was an incremental increase in excess weight loss at 3 years from the three procedures (34, 60 and 69 %, respectively). The incidence of serious perioperative complications was similar for LSG and LRYGB (2.5 %) and significantly greater than for LAGB (1 %) [21].

What Is the Extent of Disease Remission with Bariatric Surgery?

As alluded to earlier, the true benefits of bariatric surgery are measured in terms of disease resolution. A recent systematic review of several studies that comprised close to 20,000 patients reported that bariatric surgery resulted in improvement/resolution of hypertension in 63 %, diabetes in 73 % and hyperlipidemia in 65 % at mean follow-up of 5 years, with associated loss of 54 % of excess weight. Also,

Fig. 3 Sleeve gastrectomy

there was evidence for regression of left ventricular hypertrophy and improved diastolic function [22].

Previous meta-analyses of studies that comprised about 135,000 patients reported remission of diabetes following bariatric surgery in 78 % of patients and improvement in diabetes control in further 8 %. The incidence of remission correlated to the extent of weight loss and was highest for patients who had bilio-pancreatic diversion, followed by gastric bypass and, finally, adjustable banding. Weight loss and diabetes remission were maintained for 2 years or more [23]. In a nonblinded, randomized controlled trial on 60 diabetic patients, diabetes remission (fasting blood glucose less than 100 mg/dl and HbA1c < 6.5 % in the absence of pharmacological therapy) did not occur in any patient on medical management versus 75 % in the gastric bypass group and 95 % in the bilio-pancreatic diversion group. In this trial, remission of diabetes could not be predicted by preoperative BMI, duration of diabetes or weight loss [24]. There are some data that bariatric surgery provides better glucose control than medical therapy, at medium term follow-up, in patients with class 1 obesity (BMI 30–35); however, evidence is insufficient currently to reach conclusions about the use of bariatric surgery in this patient population [25].

Some of the less well-appreciated benefits of bariatric surgery are on gastrointestinal tract disease: bariatric surgery reduces the severity of nonalcoholic fatty liver disease [26]

and symptoms of gastro-oesophageal reflux disease are ameliorated in most patients after gastric bypass [27].

Finally, it is wise to recognize that remission of some obesity-related illnesses is unlikely to be achieved by surgical weight loss. For example, in patients with obstructive sleep apnea (OSA), bariatric surgery significantly reduces the apnea-hypopnea index but a residual impairment is likely to persist; patients should not expect a cure of OSA after bariatric surgery and are likely to need continued treatment to minimize complications [28].

Does Bariatric Surgery Reduce Risk of Future Disease?

An attractive benefit of bariatric surgery for obese patients, who may be free currently of comorbidity, is the potential for risk reduction. Mean 15 years follow-up of patients in the SOS reported that the risk of cardiovascular death was reduced by about one half in the bariatric surgery patients and the incidence of first-time fatal or nonfatal cardiovascular events such as myocardial infarction or stroke was reduced by one third [29]. Similarly, a systematic review of studies comprising about 17,000 patients reported a 40 % relative risk reduction for 10-year coronary heart disease risk [30]. Finally, for participants who did not have diabetes at baseline, bariatric

surgery resulted in a fivefold reduction in the incidence of diabetes, as compared to controls, at 15-year follow-up [31].

Does Bariatric Surgery Prolong Lifespan?

In the SOS, at average 10-year follow-up, there were about 25 % fewer deaths in the bariatric surgery group versus conventional treatment [5]. Similarly, 25-year follow-up data from The Program on the Surgical Control of Hyperlipidemias demonstrate statistically significant gains in overall survival and cardiovascular disease-free survival in patients who had bariatric surgery versus controls [32]. Finally, recent meta-analysis of 8 trials with 44,000 patients confirms that bariatric surgery reduces long-term mortality. Importantly, the meta-analyses demonstrated that there was a significantly greater reduction in cardiovascular mortality with gastric bypass than with gastric banding [33].

What Is the Risk of Perioperative Complications from Bariatric Surgery?

As with any operation, the decision to undertake bariatric surgery must involve careful and thoughtful deliberation of the balance of risks and benefits. Currently, bariatric surgeons can rightfully boast of incredible perioperative safety: large databases report 30-day mortality of 0.3 % [34] and single centres have shown that mortality can be reduced even further, to 0.1 % or less. Nonetheless, the patient population for bariatric surgery is extremely heterogeneous and several studies have shown that it is possible to objectively identify patients, who are at high risk for complications and mortality, in advance of surgery: the Obesity Surgery-Mortality Risk Score (OS-MRS) [35] and the Longitudinal Assessment of Bariatric Surgery (LABS) Consortium criteria [34] are two validated systems that can be easily applied in routine practice. The OS-MRS is particularly simple for clinical use and can stratify patients into three groups: A (low risk), B (intermediate risk) and C (high risk); the incidence of serious complications and mortality is clustered in group C patients, who do not constitute more than 10 % of the patient population in most series [36]. Preoperative identification of particularly high-risk patients can enable application of specific risk reduction strategies, such as staged procedures (for example, gastric balloon prior to surgery or initial sleeve gastrectomy followed by subsequent intestinal bypass), increased vigilance during the operation and in the immediate postoperative period and better-informed patient counselling. In particular, attention must be given to the risk of venous thromboembolism: a study of over 500,000 patients from the US National Inpatient Database reports deep vein thrombosis in 1.3 % and pulmonary embolism in 0.9 % of bariatric surgery

patients, despite conventional prophylaxis [37]. There is accumulating evidence that liberal use of inferior vena caval filters can reduce embolism-related mortality [38].

In terms of technical complications, the most feared, for both LRYGB and LSG, is staple-line or anastomotic leakage. A recent systematic review of studies with close to 10,000 patients who had LSG reports a 2.2 % incidence of leakage. A bougie calibre of ≥ 40 Fr. was associated with a significantly decreased incidence of leakage without affecting weight loss up to 3 years. Pertinently, buttressing of the staple line did not affect the incidence of leakage [39].

What Are the Long-Term Mechanical Complications of Bariatric Surgery?

The issue of the lifelong risk of mechanical complications is most pertinent for the adjustable band; as with any prosthesis, structural problems are inevitable and have led to some “bad press” for the band. The commonest problem is slippage; there has been much debate about distinguishing slippage from proximal gastric dilatation, and there is considerable variation in outcome-reporting definitions for slippage [40]. Even experts (Melbourne) in banding report an overall 26 % incidence of revisional procedures for proximal gastric enlargement; although, with increasing experience, the serial revision rate was reduced from 40 % in first 10 years of a banding practice to 6 % in most recent 5 years [14]. Another, less common complication is erosion of the band through the wall of the stomach. It is pertinent to note that the incidence of erosion is significantly lower with pars flaccida approach as compared to the perigastric approach. In a systematic review of 25 studies, the overall incidence of erosion was 1.4 % (range, 0.2–33 %) [41]. Rarely, banding can cause oesophageal dysmotility and lead to a mega-oesophagus [42].

As compared to banding, long-term mechanical complications from a well-performed gastric bypass are rare. Nonetheless, mechanical small-bowel obstruction must be considered in patients with abdominal symptoms following gastric bypass: the possible aetiologies are internal hernia of the intestine, adhesions, port-site hernia and anastomotic stenosis [43, 44]. There is accumulating evidence to argue that it is essential to close the mesenteric spaces—and so minimize the risk of internal hernias—during a gastric bypass [45, 46]; some experts may argue that it is clinically negligent to fail to close the spaces.

The LSG has few long-term mechanical complications (excluding sleeve dilation, which may be regarded as a failure rather than a complication); there are anecdotes of recalcitrant stenosis or ulceration that necessitate resection of the sleeve. Long-term safety—disregarding efficacy—is perhaps the salient advantage of the LSG over LRYGB and LAGB.

Is There Risk of Malnutrition after Bariatric Surgery?

BPD-DS and long-limb (distal) gastric bypass do carry some risk of protein malnutrition, and intensive nutrition support is essential. For a short-limb or proximal gastric bypass, the main nutritional/metabolic issue is in terms of bone health. As detailed discussion of these issues is beyond the scope of this paper, a relatively recent guideline may be of interest to the reader [47].

In conclusion, up-to-date knowledge of outcomes from bariatric surgery should facilitate informed decision-making. In the author's opinion, an expert bariatric surgeon must have all conventional laparoscopic procedures—and also novel options, such as endoscopic procedures and gastric electrical stimulation—in his therapeutic portfolio, in order to provide a high-quality service.

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