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Management: Part III—Surgery

John G Kral

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ABC of obesity
Management: Part III—Surgery

John G Kral

This is the fifth article in the series

Although surgery can be a potentially life extending treatment for obesity, most patients and doctors reject surgical intervention. Moreover, no national health budget or insurance can afford surgery on a very large scale. However, obesity surgery is a successful, validated, legitimate treatment and needs to be considered in some circumstances.

Preventive surgery

Healthcare workers and the public alike still lack awareness about the epidemiological consequences of and the severity of outcomes associated with pregnancy in obese women. Outcomes include fetal loss, malformations, intellectual impairment, lifelong psychosocial suffering, and programming of chronic metabolic diseases. People also lack awareness about the epigenetic transmission of obesity to their daughters, who themselves go on to become obese mothers.

Given the seriousness of the obesity epidemic, "preventive surgery" in obese young women may therefore be indicated when all else fails. Furthermore, such surgery can prevent the inexorable progression of obesity towards manifest comorbidity (such as diabetes, congestive heart failure, liver cirrhosis, and hypertension) and, ultimately, irreversible chronic disease and end organ failure.

Obesity surgery entails a trade-off between the progressively debilitating intractable symptoms and chronic diseases associated with obesity and the side effects and complications of operations designed to create chronic (relative) undernutrition. Most obese adults who have chosen surgery and had complications (including death) have been satisfied with their choice because their lives as obese individuals were often not worth living.

Early obesity surgery can bring secondary health problems. Nevertheless, the extraordinary lifelong suffering imposed by the psychosocial sequelae of extreme childhood obesity cannot be underestimated: depression, anxiety, eating disorders, vocational and marital failure, and years of life lost. Mitigating the impairment of quality of life might well be the most important outcome measure used to evaluate treatments for childhood obesity. Thus, even surgery can be considered.

Without understanding or accepting the severity of obesity and the risks of obesity (or "bariatric") surgery—or the "success" and risks of non-surgical alternatives—doctors and other health workers cannot adequately advise patients in their choice of treatment

Behavioural surgery

The different types of operations (restrictive versus bypass) have different and substantive long term effects on eating (the most important of all activities of daily living)—thus the term "behavioural surgery."

Prerequisites for considering obesity surgery are extensive patient assessment and meticulous preoperative education. Identifying motivational factors driving the patient to maintain obesity is more important before surgery than before non-surgical treatments because of the greater stakes involved.

"Successful" surgery has more potential for achieving meaningful, durable weight loss, and "failure" after surgery has much graver consequences. Assessment and education should allow improved allocation of patients to specific types of operations and postoperative care.

Compared with usual care, obesity surgery has recently been shown to reduce all cause mortality, mortality due to cancer, and cardiovascular mortality

Goal and methods of obesity surgery

Goal
To prevent or reduce storage of excess energy as fat

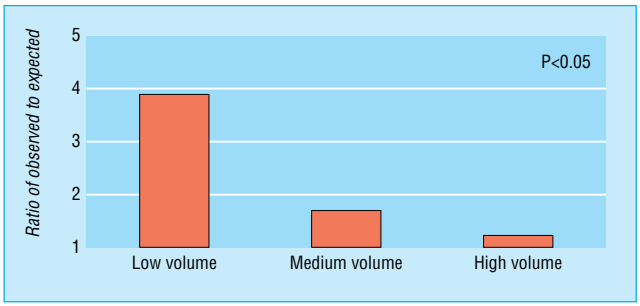
Methods
Physical—To reduce energy intake and absorption and to increase energy output
Appetite—To increase satiety (pleasant sense of fullness) or neutrality (neither hunger nor fullness); or to increase nimiety (unpleasant feeling of fullness) through aversion and discomfort

Key prerequisites for obesity surgery

- Assessment of the patient to uncover motivational factors
- Comprehensive, preoperative education for the patient
- A team experienced in bariatric laparoscopic surgery

Obstructive and diversionary operations

As with most surgery, bariatric surgery should preferably be performed laparoscopically and only by surgeons with sufficient training and expertise. Surgeon and hospital case volume affect perioperative safety: the more cases, the better the outcomes. Because of the adverse interaction between obesity and inflammatory and physiological processes related to incision size and an open abdomen, obese patients benefit more from laparoscopic approaches than other patients, regardless of operation or condition being treated.



Ratio of observed to expected inhospital mortality for patients aged ≥55 years, according to bariatric surgical volume (adapted from Nguyen et al. *Ann Surg* 2004;240:586-94)

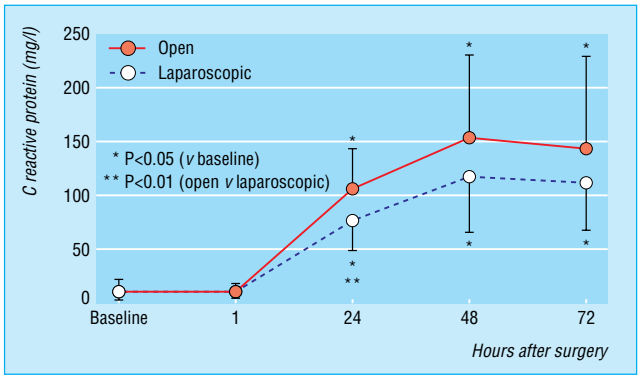
The simplest operation is laparoscopic placement of an inflatable band encircling the top 5% of the stomach, creating a proximal "pouch." During follow-up a physician can inject or withdraw saline to adjust the diameter of the band, which obstructs or restricts the passage of mainly solids (high energy liquids readily pass through). Discomfort or involuntary vomiting, or both, occur after poor chewing (such as from ill fitting dentures), rapid eating, exceeding pouch capacity (about 20 ml), or drinking shortly after eating. Repeated vomiting may cause the pouch to stretch, allowing weight gain.

Complex laparoscopic operations combine obstruction and diversion (or bypass), disconnecting the proximal pouch from the stomach and attaching it to a limb of the small bowel (known as the Roux-en-Y gastric bypass). Variations of gastric bypass—such as the biliopancreatic diversion and long limb gastric bypass, which leave less absorptive small bowel in continuity—are reserved for heavier patients with more intractable disease and severe binge eating disorder. Heavier patients (with a very high body mass index—calculated as dividing the weight in kilograms by the height in metres squared) have binge eating disorder.

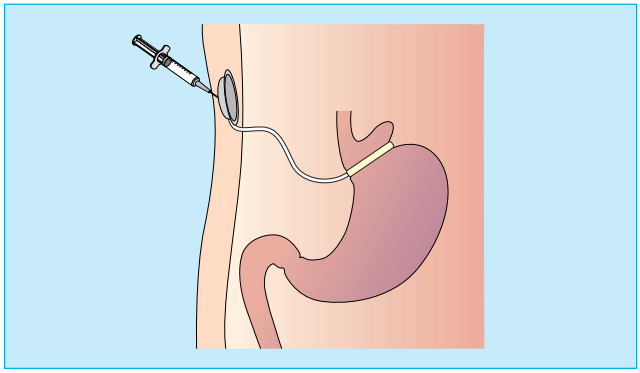
Outcomes of 24 166 patients having obesity surgery in 93 US academic hospitals by volume, 1992-2002

	High volume (>100 cases/year)	Medium volume (50-100 cases/year)	Low volume (<50 cases/year)
Mean No of cases/year	157	71	15
Mean No of days of stay	3.8*	4.4	5.1*
Mortality (%)	0.3*	0.5	1.2*
Complications (all types) (%)	10.2*	12.3	14.5*
Complications of medical care (%)	7.8*	9.5	10.8*

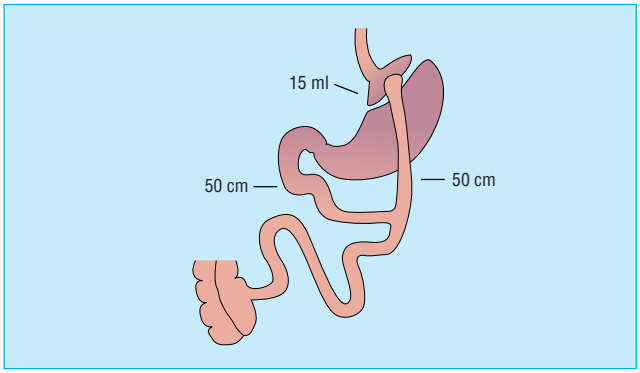
*P < 0.05. Data from Nguyen et al. *Ann Surg* 2004;240:586-94.



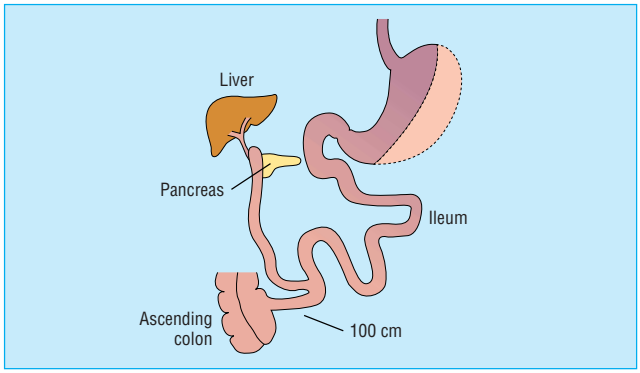
Inflammatory response (C reactive protein) to open *v* laparoscopic gastric bypass (adapted from Nguyen et al. *J Am Coll Surg* 2002;194:562)



Adjustable gastric band showing injection or withdrawal of saline to adjust diameter of band



Roux-en-Y gastric bypass with pouch separated from stomach (laparoscopic technique)



Biliopancreatic diversion with sleeve resection of greater curvature and post-pyloric, duodeno-ileal anastomosis ("duodenal switch")

During the first eight to 12 months after bypass operations, weight loss is caused by obstruction of nutrient flow. After the stomach pouch and its enterostomy stretch, continued and maintained weight loss is caused partly by altered processing and/or absorption of nutrients and partly by decreased appetite or "hunger" owing to the rush of nutrients into the limb of the small bowel.

The generic types of operations have different effects on eating behaviour, the key element of obesity, so results, risks, and benefits can vary substantially. Obstructive operations require frequent outpatient visits (monthly during the first 12-18 months) to optimise weight loss. Diversionary operations (requiring clinic visits every three months during the first year) consistently achieve greater and better maintained weight loss than gastric banding. Their greater risk of long term complications is abrogated by one yearly clinic visit with blood testing for vitamin and mineral deficiencies.

Mechanisms of obesity surgery

Procedures that are only obstructive
- Delayed emptying of solids
- Diminished capacity for solids
- Oesophagogastric distension

Bypass procedures
- Transitory restriction
- Altered absorption
- Neuroendocrine effects on appetite

Instructions on eating for patients who have had obstructive stomach surgery

Eating and drinking	Vomiting
Eat slowly and undisturbed	If you vomit, find out why
Chew well	Don't eat or drink for four hours
Drink before food or more than an hour after food	Start with liquids after four hours
Stop if your stomach feels full	If you still vomit, call your surgeon

Indications

Both surgical and non-surgical treatments have improved over the past 25 years. Diet and exercise programmes have been developed and four new drugs have been launched. The safety and efficacy of surgery has improved remarkably. Calculations of cost per kilogram of maintained weight loss have shown a "break even" comparison after less than four years—results that favour surgery, if costs of drugs, supplements, complications and side effects are taken into account. For ethical and scientific reasons, randomisation studies of surgery and non-surgical treatment cannot be done. Furthermore, it is very difficult to retain participants in non-surgical treatment long enough to provide meaningful comparable outcome data.

The widely accepted indication for surgery since the 1960s has been a body mass index (BMI) of ≥ 40 or 35-40 with obesity related comorbidity. Recommended requirements for surgery include that patients should have seriously tried to lose weight by other means. In fact, most patients seeking surgery have tried to lose weight five to seven times. Candidates should not have behavioural conditions likely to interfere with postoperative care. Hospitals should have a multidisciplinary team with appropriate expertise for evaluating, operating on, and managing severely obese patients. Age criteria are usually a minimum of 20-25 years and a maximum of 60-65.

With improved safety—owing to the laparoscopic approach and the relatively simple and reversible gastric band technique—indications are expanding, with trends towards accepting patients with a lower BMI (30-35) and a wider age range (from adolescence (12-17 years) to 70 years and above) in appropriate candidates. Weight regain after purely restrictive operations can be treated by using "rescue" medication (which interferes with the absorption of lipids (orlistat) and/or carbohydrates (acarbose)) or, ultimately, by adding a diversionary procedure.

Indications for obesity surgery must be viewed in the context of results of alternative, non-surgical treatments and their costs and risks, and the patient's assessment of quality of life. This supports the importance of educating and assessing patients. Data showing superior efficacy of obesity surgery over optimal non-surgical treatment have been unequivocal since the early 1960s, when such surgery began

Suitability for referral for surgery
- Candidates should understand the medical need to lose weight and have previously tried to lose weight
- They should have no psychological or psychiatric problems that might interfere with follow-up (drug misuse, borderline personality)
- There should be sufficient resources for follow-up (a multidisciplinary team, compassionate partner, and time)

High risk patients, especially men with a BMI of >55, need complex surgery and may benefit from a staged approach, starting with a simple restrictive operation, followed as needed (depending on weight loss maintenance) by a diversionary stage

Outcomes

Success is difficult to define because of disparate opinions among patients, doctors, the insurance industry, and tax payers. The difficulty is compounded by the lack of information about optimal amounts and rates of weight loss: how much is "enough" and how is enough determined? Actuarial data define "desirable" weight standards for the general population, but insufficient and conflicting data are available for those who have lost weight voluntarily and maintained the loss.

Conditions improved or prevented by obesity
- Asthma
- Cancers (many)
- Diabetes
- Dyslipidaemia
- Oesophagitis
- Heart failure
- Hypertension
- Infectious diseases
- Infertility
- Obstetric complications
- Operative risk
- Liver cirrhosis
- Quality of life
- Sleep apnoea
- Thrombosis

Rather than focusing on weight loss as the primary outcome measure, it is more appropriate to evaluate improvements in comorbidities and quality of life, although in patients with a BMI of >35 mortality (including operative) is lower in patients having operations than in those receiving usual care. Numerous observational and case studies over four decades have consistently found improved established risk factors for premature death, reduction of comorbidity, and improved quality of life after surgical weight loss.

At the same time, obesity surgery is associated with mortality, morbidity, complications, side effects, and unwanted sequelae, all of which must be included in the risk-benefit analysis. Mortality statistics need stratification by generic type of operation, age, sex, and comorbidity profile. However, it is difficult preoperatively to predict long term outcomes for the various types of operations. Social factors such as having a stable life situation (being married, having a job) and being white predict favourable outcomes, whereas binge eating or overconsumption of "soft calories" (calories derived from liquids or soft foods such as ice cream and chocolate) may be detrimental.

Deficiencies of vitamins and minerals are among the most common and troublesome long term complications of obesity surgery. They are more common after diversionary operations, due to poor digestion and malabsorption from exclusion of the stomach and shortened continuous small bowel. Vitamin and mineral deficiency is preventable with assiduous monitoring and adequate supplementation, both of which require the patient's cooperation, which often is difficult to achieve.

As with all surgery, the proficiency and dedication of the surgeons and their teams are critical. Obesity surgery has become the victim of its own success owing to improved perioperative results, general awareness of the seriousness of the disease, and substantial increases in the numbers of obese patients, which has led to the rapid recruitment of surgeons who are not yet sufficiently trained. Currently, strict guidelines and performance evaluations are being developed as part of quality assurance efforts and demands from third party payers.

Conclusions

- Operations use different mechanisms for weight loss
- One type of operation does not fit all
- Preoperative evaluation and patient education are critical
- The laparoscopic approach is preferable
- Surgery reduces mortality compared with usual care

Further reading

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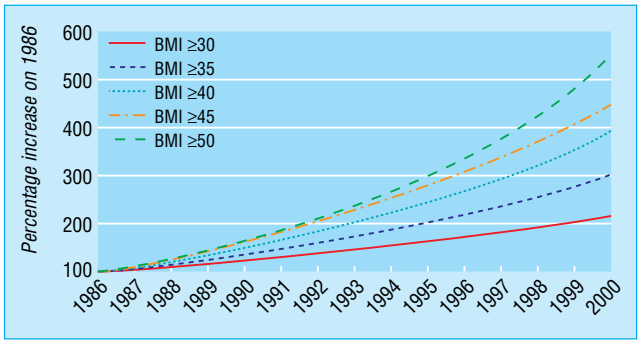
Adverse effects of obesity surgery

Operative (about 10%)	Long term (20-30%)
Thromboembolism	Iron deficiency
Bleeding	Calcium and vitamin D deficiency
Pneumonia	Vitamin B-12 deficiency
Stenosis	Vitamin B-1 deficiency (vomiting)
Ulcers	Protein deficiency (diarrhoea)
Infection or hernia	Gallstones
Peritonitis	Weight regain
Death ≤1%	

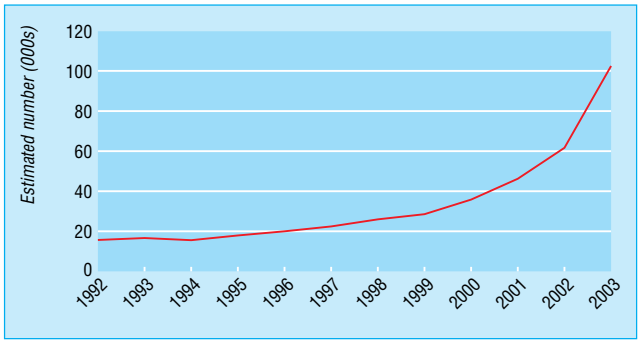
Predictors of response

Demographic—Age, sex, race, marital status, education, job, insurance
Physiological—Body mass index, body composition (fat cell size, fat distribution, lean body mass), metabolic rate (resting, total, diet*), blood chemistry
Comorbidity—Diabetes, hypertension, cardiopulmonary disease, sleep apnoea, musculoskeletal disorders, thromboembolism
Psychological—MMPI disorder,† sexual abuse, negative life experience, secondary gain, codependency, denial of disease
Past performance—Weight loss, smoking cessation, attendance at appointments, drug and alcohol use
Eating behaviour—Eating sweets, nibbling, gorging, binge eating, restrained eating, poor impulse control

*Diet induced thermogenesis.
†According to Minnesota multiphasic personality inventory



Obesity trends in United States, by body mass index, 1986-2000. Adapted from Sturm R. *Arch Intern Med* 2003;163: 2146-8



Estimated numbers of obesity operations in United States, 1992-2003. Adapted from Steinbrook R. *N Engl J Med* 2004;350:1075-9

John G Kral is professor of surgery and medicine in the department of surgery, SUNY Downstate Medical Center, New York.

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Competing interests: John G Kral is a member of the North American Association for the Study of Obesity and the American Society for Bariatric Surgery. For series editors' competing interests, see the first article in this series.