The role of endoscopy in the management of complications after bariatric surgery

Essay

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LIST OF ABBREVIATIONS

BIB	Bioenteric intra gastric balloon
BMI	Body mass index
BPD	Biliopancreatic diversion
DS	Duodenal switch
DVT	Deep venous thrombosis
FDA	Food and drug administration
GJ	Gastrojejunal
JIB	Jejunoileal bypass
JJ	Jejunojejunal
LAGB	Laparoscopic adjustable gastric banding
LRYGBP	Laparoscopic roux en y gastric bypass
LSG	Laparoscopic sleeve gastrectomy
RYGBP	Roux en y gastric bypass
TOGA	Transoral gastroplasty
TTS	Through the scope
VBG	Vertical banded gastroplasty

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INTRODUCTION

Definition of obesity

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse affect on health. It is assessed by the body mass index (BMI) and further evaluated in terms of fat distribution via the waist–hip ratio and total cardiovascular risk factors**.** BMI is highly related to both percentage body fat and total body fat **(Sweeting 2007)**.

BMI

Body mass index or BMI is a simple and widely used method for estimating body fat mass **.** BMI was developed in the 19th century by the Belgian statistician and anthropometrist Adolphe Quetelet. BMI is an accurate reflection of body fat percentage in the majority of the adult population. It however is less accurate in people such as body builders and pregnant women. A formula combining BMI, age and gender can be used to estimate a person's body fat percentage to an accuracy of 4% **(Seidell 2005).**

$$BMI = weight\ (kg) / height^2\ (m^2)$$

BMI	Classification
< 18.5 kg/m^2	underweight
18.5–24.9 kg/m^2	normal weight
25.0–29.9 kg/m^2	overweight
30.0–34.9 kg/m^2	class I obesity
35.0–39.9 kg/m^2	class II obesity
> 40.0 kg/m^2	class III obesity

(**Table 1**, classification of obesity)

The most commonly used definitions, established by the World Health Organization (WHO) in 1997 and published in 2000, provide the values listed in the table above.Some modifications of the WHO definitions have been made. The surgical literature breaks down "class III" obesity into further categories **(Gabriel 2006)**

- Any BMI > 40 kg/m^2 is *severe obesity*.
- A BMI of 40.0–49.9 kg/m^2 is *morbid obesity*.
- A BMI of >50 kg/$m^2$is *super obesity*.

As Asian populations develop negative health consequences at a lower BMI than Caucasians, some nations have redefined obesity. The Japanese have defined obesity as any BMI greater than 25 kg/m^2-**(Kanazawa et al., 2002).** while China uses a BMI of greater than 28 kg/m^2 **(Bei-Fan 2002).**

Waist circumference and waist–hip ratio

The waist circumference (>102 cm in men and >88 cm in women) and the waist–hip ratio (the circumference of the waist divided by that of the hips of >0.9 cm for men and >0.85 cm for women) are both used as measures of central obesity **(Yusuf et al., 2004).**

Body fat percentage is total body fat expressed as a percentage of total body weight. It is generally agreed that men with more than 25% body fat and women with more than 33% body fat are obese .Body fat percentage can be estimated from a person's BMI by the following formula:

$$\textit{Bodyfat}\ \% = (1.2 \times \textit{BMI}) + (0.23 \times \textit{age}) - 5.4 - (10.8 \times \textit{gender})$$

where gender is 0 if female and 1 if male **.**

This formula takes into account the fact that body fat percentage is 10 percentage points greater in women than in men for a given BMI. It recognizes that a person's percentage body fat increases as they age even if their weight remains constant. The results of this formula have an accuracy of 4% **(Schwarz and Steven 2007).**

There are many other methods used to determine body fat percentage. Hydrostatic weighing, one of the most accurate methods of body fat calculation, involves weighing a person underwater. Two other simpler and less accurate methods have been used historically but are now not recommended **.** The first is the skinfold test, in which a pinch of skin is precisely measured to determine the thickness of the subcutaneous fat layer .The other is bioelectrical impedance analysis which uses electrical resistance. Bioelectrical impedance has not been shown to provide an advantage over BMI **(Jebb and Wells 2005).**

Other Body fat percentage measurement techniques are used mainly for research include computed tomography (CT scan), magnetic resonance imaging (MRI), and dual energy X-ray absorptiometry (DEXA). These techniques provide very accurate measurements, but it can be difficult to obtain in the severely obese due to weight limits of most equipment and insufficient diameter of many CT or MRI scanners **(Jebb and Wells 2005).**

Effects on health

Excessive body weight is associated with various diseases, particularly cardiovascular diseases, diabetes mellitus type 2, obstructive sleep apnea, certain types of cancer, and osteoarthritis **.** As a result, obesity has been found to reduce life expectancy **(Haslam and James 2005).**

Mortality

Obesity is one of the leading preventable causes of death worldwide **(Barness et al., 2007)** Large scale American and European studies have found that mortality risk varies with BMI; the lowest risk is found at a BMI of 22.5–25 kg/m^2 **(Whitelock et al., 2009),** in non smokers and at a BMI of 24–27 kg/m^2 in current smokers and increases with changes in either direction and Obesity increases the risk of death in current and former smokers as well as in those who are non smokers **(Pischon et al., 2008).**

A BMI of over 32 kg/m^2 has been associated with a doubled mortality rate among women over a 16-year period· and obesity is estimated to cause an excess 111,909 to 365,000 death per year in the United States and obesity on average reduces life expectancy by six to seven years **(Haslam and James 2005).** A BMI of 30–35 kg/m^2 reduces life expectancy by two to four years **(Whitlock et al., 2009).** while severe obesity (BMI > 40 kg/m^2) reduces life expectancy by 20 years for men and five years for women **(Schwarz and Steven 2007).**

Morbidity

Obesity increases the risk of many physical and mental conditions. These comorbidities are reflected predominantly in the metabolic syndrome which is a combination of medical disorders, which includes diabetes mellitus type 2, high blood pressure, high blood cholesterol, and high triglyceride levels **(Grundy et al., 2004).**

Complications are either directly caused by obesity or indirectly caused by mechanisms sharing a common cause

such as a poor diet or a sedentary lifestyle. The strength of the link between obesity and specific conditions varies. One of the strongest is the link with type 2 diabetes. Excess body fat underlies 64% of cases of diabetes in men and 77% of cases in women **(Seidell 2005).**

Health consequences can be categorized by the effects of increased fat mass (osteoarthritis, obstructive sleep apnea, social stigmatization) or by the increased number of fat cells (diabetes, cancer, cardiovascular disease, non-alcoholic fatty liver disease)**.** Increases in body fat alter the body's response to insulin, potentially leading to insulin resistance. Increased fat also creates a proinflammatory state, increasing the risk of thrombosis **(Bray 2004).**

Cardiology	• ischemic heart disease: angina and myocardial infarction **(Yusuf et al., 2004).** • congestive heart failure· • high blood pressure • abnormal cholesterol levels • deep vein thrombosis and pulmonary embolism **(Darvall et al., 2007).**
Endocrinology and Reproductive system	• diabetes mellitus polycystic ovarian syndrome. • menstrual disorders • infertility • complications during pregnancy • birth defects (**Haslam and James 2005**). • intrauterine fetal death (**Arendas et al .,2008**).
Neurology	• stroke • meralgia paresthetica (**Harney and Patijn 2007**). • migraines (**Bigal and Lipton 2008**).

	• carpal tunnel syndrome (**Mollayousefi et al., 2008**). • dementia (**Beydoun et al., 2008**). • idiopathic intracranial hypertension (**Wall 2008**).
Psychiatry	• depression in women. • social stigmatization.
Rheumatology and Orthopedics	• gout (**Choi et al., 2005**). • poor mobility (**Tukker et al., 2008**). • osteoarthritis. • low back pain (**Molenaar et al., 2008**).
Dermatology	• stretch marks. • acanthosis nigricans. • lymphedema. (**Yosipovitch et al., 2007**) • cellulitis. • hirsutism . • intertrigo (**Hahler 2006**).
Gastrointestinal	• gastroesophageal reflux disease. • fatty liver disease. • cholelithiasis (gallstones) **(Haslam and James 2005**).
Oncology	• breast, ovarian • esophageal, colorectal • hepatic, pancreatic • gallbladder, gastric • endometrial, cervical • prostatic, renal • non-Hodgkin's lymphoma, multiple myeloma **(Calle et al., 2003)**.
Respirology	• obstructive sleep apnea • obesity hypoventilation syndrome • asthma

	• increased complications during general anaesthesia (**Poulain et al., 2006**).
Urology and Nephrology	• erectile dysfunction (**Esposito et al., 2004**). • urinary incontinence (**Hunskaar 2008**). • chronic renal failure(**Eierblad et al., 2006**). • hypogonadism (**Makhsida et al., 2005**).

(**Table 2** complications of obesity)

Management

The main treatment for obesity consists of dieting and physical exercise. Diet programs may produce weight loss over the short term, **(Strychar 2006).** but keeping this weight off can be a problem and often requires making exercise and a lower calorie diet a permanent part of a person's lifestyle. **(Tate et al., 2007).** Success rates of long-term weight loss maintenance are low and range from 2–20% **(Wing et al., 2005).** In a more structured setting, however, 67% of people who lost greater than 10% of their body mass maintained or continued to lose weight one year later**..** An average maintained weight loss of more than 3 kg or 3% of total body mass could be sustained for five years. The most effective, but also most risky treatment for obesity is bariatric surgery,and due to its cost and risk of complications, researchers are searching for new obesity treatments. **(Weiss et al., 2007).**