



Surgical Treatment for Obesity, Metabolic Syndrome and Diabetes

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Epidemiology and Paradigm Shift of Obesity

Historically, obesity has been perceived as a cosmetic issue. Recently, obesity has become a global epidemic. Worldwide obesity has tripled since 1975. In 2016, more than 1.9 billion were overweight (Body Mass Index $>25\text{kg/m}^2$ for Caucasians, $>23\text{kg/m}^2$ for Asians), of these, over 650 million were obese, (BMI $>30\text{kg/m}^2$ for Caucasians, $>25\text{kg/m}^2$ for Asians)^{1,2}. Hong Kong is no exception in this epidemic. According to a press release in 2017 from the Centre for Health Protection, Department of Health, Hong Kong Special Administrative Region, 57% of men and 43.6% of women of the population are overweight or obese in Hong Kong. The situation is expected to deteriorate and the morbidity and mortality caused by overweight and obesity will surpass that caused by malnutrition. Obesity and the metabolic syndrome are closely interrelated especially with diabetes, thus a term “diabesity” is recently coined. The prevalence rate of type 2 diabetes is 9.8% in Hong Kong³. Diabetes tends to develop in Asians at a younger age and lower BMI³. Half of the patients with diabetes are diagnosed in their middle age in Hong Kong. According to the Hong Kong Diabetes Registry, during 1995–2008, cardiovascular diseases accounted for 50% of deaths in diabetic patients. Fifty-five percent of Asian patients with diabetes develop albuminuria and most of them end up in end-stage renal failures that require dialysis or renal transplantation. Obesity is no longer a simple cosmetic issue but a major health problem. It should be regarded as an energy regulation disorder that poses unprecedented challenges to our health care system. Recognition of the magnitude and impact of this epidemic by medical doctors, health policy makers and the general population is the foundation for the success in combating obesity and the associated comorbidities.

Treatment Options: Conventional versus Interventional Therapy

Diet and lifestyle modification were once regarded as the mainstay of treatment for obesity and also a crucial component for patients with diabetes. However, the effectiveness for weight loss is limited when the BMI is beyond certain levels. Randomised controlled trials demonstrated that a 5% loss of the total body weight is possible in primary care practice or under professional supervision programmes^{4,5}. A large-scale study (The Look AHEAD Study) with long term follow up (8 years)

showed that intensive lifestyle intervention can achieved a 4.7% loss of body weight compared to 2.1% in the usual care group in obese patients with type 2 diabetes (T2DM), $p<0.016$. An important finding of the study is that intensive lifestyle intervention is unable to reduce the cardiovascular effects resulting from T2DM⁷.

Pories et al. published the landmark study entitled “Who would have thought it?” in 1995⁸. This study aroused the awareness of the efficacy of surgery on obesity and the metabolic syndrome. More than 600 patients followed up for 14 years showed a loss of one third of their initial body weight and 82.9% of T2DM patients and 98.7% of patients with impaired glucose tolerance had remained in remission from their disease for more than 10 years. Other comorbidities of the metabolic syndrome including hypertension, hyperlipidaemia and obstructive sleep apnoea also had significantly improved. Since then, numerous studies including randomised controlled trials and meta-analyses have proven the superiority of surgery in terms of effectiveness and duration in body weight control and diabetic remission^{9–12}. A recently published study demonstrated that T2DM patients treated by surgery had significantly less microvascular complications compared to the control group¹³. This implies surgery can effectively reduce nephropathy, stroke and cardiovascular diseases resulting from T2DM.

Formulating the most appropriate therapeutic strategy requires an individual consideration on various factors including the pre-morbid status and different prognostic factors. BMI is one of most commonly used instruments to stratify patients for diet and lifestyle modification, pharmacotherapy or interventional treatment. The cut off values of BMI for different treatments are detailed in the practice guidelines section.

Bariatric Surgery or Metabolic Surgery?

In Greek, “Baros” means weight or burden¹⁴. Bariatric surgery means the use of gastrointestinal surgery to induce weight loss. With the robust effect of bariatric surgery to ameliorate or even to cure metabolic disorders, the term metabolic surgery was coined. It is defined as the use of gastrointestinal surgery with the intent to treat T2DM and obesity. Conceptually, gastrointestinal surgery with the purposes of treating any component of the metabolic syndrome deserves the nomenclature of metabolic surgery.

Practice Guidelines

The body mass index (BMI) is the most commonly used factor to stratify patients for different therapeutic strategies. However, the cut-off values of therapeutic action points are different in different ethnic groups. This is because beyond certain values of BMI, the risks of development of obesity-related comorbidities are different between ethnic groups. For instance, Asians tend to develop T2DM and cardiovascular diseases at a lower BMI level when compared to Caucasians. Therefore, the definition of therapeutic action points from the World Health Organization (WHO) is different between the East and West populations. The WHO expert consultation identified potential public health action points for Asians as: 23.0, 27.5, 32.5 and 37.5 kg/m² which are different from the universal action points for the Western population as: 25, 30, 35 and 40 kg/m², Table 1 and Table 2². In general, Asians have BMI reference level that is 2.5kg/m² lower when compared to that of Caucasians. Hence, practice guidelines based on BMI vary slightly in different countries.

Table 1. Classification of BMI for the Western Population

Classification	BMI (kg/m ²)	Disease risk*
Underweight	<18.5	---
Normal	18.5-24.9	---
Overweight	25.0-29.9	Increased
Obesity (I)	30.0-34.9	High
Moderate obesity (II)	35-39.9	Very high
Extreme obesity (III)	≥40	Extremely high

* Disease risk for type 2 diabetes, hypertension, and cardiovascular disease, relative to normal weight and waist circumference

Table 2. Classification of BMI for the Eastern population

Classification	BMI (kg/m ²)	Risk of comorbidities	
---		Waist circumference	
		<90cm (M)	>90cm (M)
		<80cm (F)	>80cm (F)
Normal weight	18.0-22.9	Average	Increased
Overweight	≥23		
At risk	23-24.9	Increased	Moderate
Obese I	25-29.9	Moderate	Severe
Obese II	≥30	Severe	Very Severe

The practice guidelines on obesity management continue to be refined. A consensus conference of the National Institutes of Health (NIH) of the United States held in 1978 stated that jejunoileal bypass was a primary surgical procedure for obesity^{15,16}. The procedure was gradually abandoned due to substantial side effects. Various surgical procedures evolved with accumulation of scientific evidence in the subsequent 10 to 15 years. In 1991, NIH launched another consensus development conference statement to recommend gastrointestinal surgery for severe obesity such as those with BMI ≥40 kg/m² or with BMI ≥35 kg/m² and with presence of comorbidities¹⁷. In 2000, The Practice Guide published by NIH categorised different treatment modalities using BMI as a stratification factor as listed in Table 3¹⁸. Similar practice guidelines on interventional therapy for obesity were recently published in the United Kingdom¹⁹ and Europe²⁰.

For Asians, the consensus on the indication of interventional treatment for obesity and metabolic

disorders is defined by the Asia Pacific Chapter Consensus Statement of the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) in 2011²¹. It states that patients with BMI ≥35 kg/m² regardless of presence of comorbidity or patients with BMI ≥30 kg/m² and with unsatisfactory control of T2DM or the metabolic syndrome by lifestyle modification and medical treatment should be treated by surgery. Any interventional treatment for patients with BMI less than 30 kg/m² should be limited to clinical trials with approval by research ethics committee under individual institutional review boards.

Table 3. The Practice Guide from National Institutes of Health published in 2000

	BMI category (kg/m ²)				
Treatment	25-26.9	27-29.9	30-34.9	35-39.9	≥40
Diet, lifestyle modification	+	+	+	+	+
Drug			With comorbidities	+	+
Surgery				With comorbidities	+

National Institutes of Health of United States

The Second Diabetes Surgery Summit was held in London in 2016. The joint Statement published was probably the most recent and important practice recommendation in the field. It was endorsed by 45 international professional societies including the American Diabetes Association and the International Diabetes Federation²². Surgery is now regarded as part of the standard treatment for T2DM worldwide. The statement takes the BMI reference levels for both the Western and Eastern populations into account for the severity of obesity as well as the condition of T2DM control. The algorithm of treatment is shown in Fig. 1.

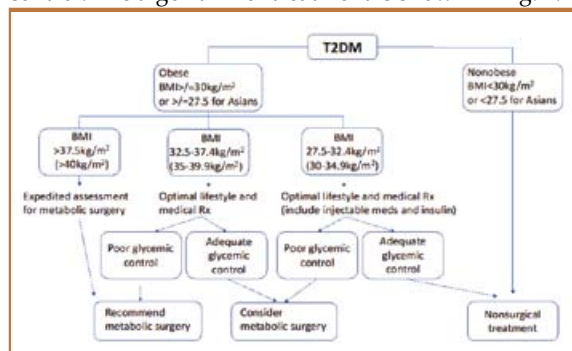


Fig. 1. Algorithm on the indication of metabolic / bariatric surgery

All BMI action thresholds reduced by 2.5 kg/m² compared to the Western population

T2DM: Type 2 diabetes mellitus

Rx: Treatment

BMI: Body mass index

Current Situation in Hong Kong

Since the first bariatric surgery performed in Hong Kong in 2002, there has been more than one thousand patients who have received surgery for the treatment of obesity or the metabolic syndrome. The enthusiasm in this field is gradually proliferating. Currently, there are 8 public hospitals and 4 private hospitals providing bariatric and metabolic surgery services in Hong Kong. The number



of operations has increased exponentially from less than 10 to more than 200 every year. The efficacy and safety of surgical procedures remain the main concerns, both for the patients and referring medical practitioners. According to the Surgical Outcomes Monitoring & Improvement Programme (SOMIP) Report from the Hospital Authority, there was only one peri-operative mortality since the introduction of bariatric surgery in Hong Kong. The overall morbidity rate gradually has been reduced from more than 14% in 2009 to 4.9% in 2017. However, the morbidity rate of individual centres varies from 0-33% with high volume centres having lower rates. The median hospital stay ranges from 3 to 5 days for most centres.

The efficacy of bariatric surgery is procedure dependent. Currently, standard bariatric or metabolic procedures include duodenal switch, laparoscopic Roux-en-Y gastric bypass (RYGB), laparoscopic sleeve gastrectomy (SG) and laparoscopic adjustable gastric banding. Duodenal switch is the most potent procedure but it is seldom performed due to the technical complexity and its high complication rate. Laparoscopic adjustable gastric banding is the least effective one but again is a procedure that is gradually being abandoned because a significant number of patients require revision surgery. SG is the procedure of choice, particularly for Asians. The considerations in choosing between RYGB versus SG are that although the two procedures have similar efficacy, SG is technically easier and there is no need for lifelong dietary supplements. The risk of the gastric remnant developing cancer is another concern although the incidence is low.

In 2007-2016, a total of 123 patients underwent bariatric surgery in Queen Mary Hospital, the University of Hong Kong. The mean age was 42 year (range: 16-68) and 49 (39.8%) were males. Demographic factors are listed in Table 4. Among the 123 patients, 86% had laparoscopic sleeve gastrectomy. There was no 30-day or hospital mortality. The morbidity was minimal: 1 patient had deep vein thrombosis, 1 had acute renal impairment treated with rehydration and 2 had self-limiting bleeding and treated with blood transfusion. The mean percentage of excess body weight loss at 3-years and 5-years were 55.4 +/-27.2% and 44.5 +/-25.0%, respectively. This is comparable to the results of other countries announced in the Third International Summit for Sleeve Gastrectomy: 57.3-62.7%. Sixty-four (52%) patients had T2DM before surgery. The results are shown in Fig. 2.

Insurance Coverage

Most insurance companies currently do not provide support for bariatric or metabolic surgery as a treatment for obesity, diabetes or the metabolic syndrome in Hong Kong. It has long been clearly declared by the insurance industry that obesity or related disorders are not an area that they will support. The rationale behind this is unclear but often the reason of rejection of reimbursement is "non-essential" medical treatment. However, with accumulation of more scientific evidence, there has been a paradigm shift on obesity, which should not be regarded as a cosmetic problem but an energy regulation disorder. Surgery has been endorsed internationally as one of the standard treatment

modalities for diabetes and the metabolic syndrome. More important is that surgery has been proven effective in reducing microvascular complications resulted from T2DM. This provides a scientific foundation as the mechanisms to defer the development of T2DM complications such as diabetic nephropathy, stroke or cardiovascular disease. The financial implication on this is that bariatric and metabolic surgery can reduced the health care financial burden and medical cost for the insurance industry²³. Some large companies in the United States and United Kingdom do provide coverage for metabolic surgery. It is advised that the insurance industry should revise this policy and provide support to this new modality of treatment.

Conclusion and Future Perspectives

Obesity has become an epidemic globally and Hong Kong is no exception. The prevalence of T2DM is rapidly rising and tends to develop in younger age and lower BMI in comparing to the Western population. Surgery is now a standard treatment modality for obese patients with T2DM as well as with the metabolic syndrome. Internationally endorsed practice guidelines are already available. The efficacy and safety are also well proven. This field is gaining popularity. The morbidity rates vary significantly between high volume and low volume centres. To ensure safety and a high quality of surgery, proper training is essential. Bariatric surgery reduces health care cost and the insurance industry should cover this treatment modality so as to benefit the patients.

Table 4. Demographic factors of patients who underwent bariatric surgery in Queen Mary Hospital

Factors	N=123 (100%)
Mean preoperative BMI (range)	39.32 (29.4-57)
Mean weight in kg (range)	107.79 (74-165)
Mean excess weight in kg (range)	44.07(16.31 – 114.63)
Patient with T2DM	64 (52.0)
Patient with hypertension (%)	78 (63.4)
Hyperlipidaemia	64 (52)

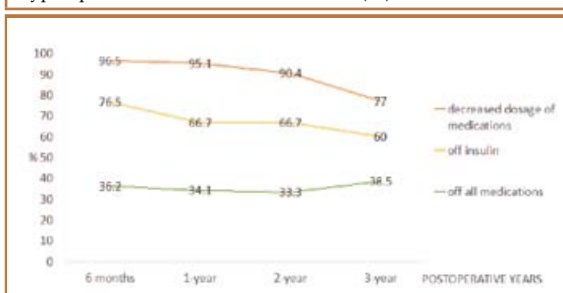


Fig. 2. Post-operative diabetic medication usage for patients treated in Queen Mary Hospital

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Radiology Quiz

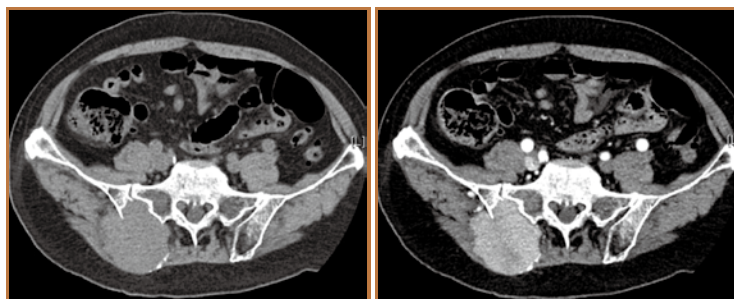
Radiology Quiz

Dr Victor LEE

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Dr Victor LEE



A 69 year old gentleman complained of acute abdominal pain and underwent contrast enhanced CT scans of the abdomen and pelvis. An incidental osseous lesion was detected at the right ilium.

Questions

1. What are the findings on the CT images?
2. What are the differential diagnoses?

(See P.37 for answers)