

# Practical management of obesity

**Dr Tomás Ahern and Dr Donal O'Shea, Consultant Endocrinologist,  
Department of Endocrinology, St Vincent's University Hospital, Dublin**

## Introduction

Obesity is a serious and prevalent disorder, the effective management of which requires ongoing care. The rate of obesity in the US in 2001 was 32% compared to 14.5% in 1971.<sup>1</sup> Obesity is an independent predictor of mortality<sup>2,3</sup> and is associated with a considerable reduction in life expectancy for both men and women.<sup>4,5</sup> In addition, obesity is associated with increased morbidity with an increased incidence of hypertension, diabetes mellitus, hyperlipidaemia, cholelithiasis, ischaemic heart disease (IHD), heart failure, atrial fibrillation, cancer, stroke, osteoarthritis, obstructive sleep apnoea syndrome and psychosocial dysfunction.<sup>3,4,6-15</sup>

Data from prospective randomised, controlled trials have demonstrated that intentional weight loss improves many of the medical complications associated with obesity<sup>16-21</sup> and can also prevent or delay the onset of obesity-related diseases.<sup>22,23</sup> Most of these benefits are proportionate to weight loss and begin after only modest (5%) reductions of initial body weight.<sup>16,22,23</sup>

The aim of obesity therapy is to improve or eliminate obesity co-morbidities and decrease the risk of future obesity-related medical complications. Successful therapy can also result in improved appearance, physical function and quality of life. Fat

loss induced by negative energy balance is necessary to achieve metabolic benefits.<sup>24</sup> This concept of eating fewer calories than those expended is the crucial tenet of obesity management.

Dietary intervention and physical activity, supported by behaviour modification therapy, are the cornerstones of treatment for all obese patients. Pharmacotherapy and bariatric surgery can be useful additional treatment options in properly selected patients (see Table 1). Pharmacotherapy or bariatric surgery should only be considered in those who fail to meet weight loss targets with conventional therapy.

This paper will discuss the assessment of the obese patient and the various treatment options available.

## Assessment

Assessment of the obese patient involves finding any possible treatable causes, obtaining a weight and diet history, gauging motivation to change and determining the level and type of obesity. Screening for associated diseases is also useful.

## History

The majority of cases of obesity are due to increased calorie intake and a sedentary lifestyle. It is worthwhile, however,

**Table 1. Overview of obesity management treatment options based on body mass index (BMI) and risk factors\***

BMI (kg/m <sup>2</sup> )	With >2 risk factors**	Dietary intervention	Physical activity	Behaviour modification	Pharmacotherapy	Bariatric surgery
25.0-29.9		+	+	+		
27.0-29.9	+	+	+	+	+	
30.0-39.9		+	+	+	+	
35.0-39.9	+	+	+	+	+	+
≥40.0		+	+	+	+	+

\* Adapted from NIH guidelines.<sup>16</sup>

\*\* Risk factors include IHD, IHD risk factors, obesity-related diseases, high waist circumference, poor aerobic fitness and >5kg weight gain since the age of 18-20 years.

assessing for specific medical causes to allow tailored management thereof (see Table 2). It is beyond the scope of this review to go into the precise treatments of these various disorders.

**Table 2. Causes of obesity**

Drugs	Endocrine
Antidepressants	Cushing's syndrome
Neuroleptics	Hypothyroidism
Anticonvulsants	Polycystic ovarian syndrome
Diabetic drugs	Hypogonadism
Steroid hormones	Hypothalamic syndrome
Oral contraceptives	Growth hormone deficiency
Antihistamines	Pseudohypoparathyroidism
Beta blockers	

One of the factors that help determine mortality and morbidity risk is the age of onset of obesity. Adults who were small for gestational age at birth and who rapidly gained weight during their early years have a high incidence of diabetes, the metabolic syndrome and ischaemic heart disease.<sup>25-29</sup> Those who become obese before the age of 40 develop co-morbid conditions such as hypertension and diabetes earlier and thus have a greater mortality risk.<sup>30</sup>

The Nurses' Health Study and Health Professionals Follow-up study demonstrated a proportionately increased risk of ischaemic heart disease with weight gain after the age of 18-20.<sup>31,32</sup> The risk of a cardiac event increases by 25% for a weight gain of 5kg and increases by 60% for a weight gain of 10kg. These and other epidemiological studies show a similar proportionately increased risk of cholelithiasis and diabetes.<sup>33,34</sup>

Symptoms of obstructive sleep apnoea syndrome should be sought in every patient with obesity as this condition increases the risk of ischaemic heart disease and is readily treatable.

For these reasons, a smoking and medication history should also be ascertained.

A determination of the patient's readiness to make an effort to lose weight is important for guiding treatment options. One must ascertain the motivation for weight loss, the stressors that will make focusing on weight control difficult and the amount of time the patient has available to devote to serious weight loss effort, i.e. the patient's ability to comply with a proposed treatment plan. The presence of a psychiatric illness such as an eating disorder, a mood disorder or a substance abuse disorder should also be sought.

A psychologist can help verify a patient's stage of readiness (see Table 3). People in the pre-contemplation stage are usually not candidates for changing lifestyle.

**Table 3. Stages of readiness for change**

1. Pre-contemplation	Before one has thought about change
2. Contemplation	Giving thought to the problem
3. Action	Doing something to initiate change
4. Maintenance of behaviour change	Making efforts to prevent relapse

### Examination

The level and type of obesity can be clarified by measuring the body mass index (BMI) and the weight circumference. The BMI is calculated by dividing the weight (in kilograms) by the square of the height (in metres). Normograms and tables are readily available to make the BMI easy to ascertain. BMI is correlated with percentage of body fat in a curvilinear fashion and is relatively unaffected by height.<sup>35</sup> BMI is directly proportional to disease risk and subsequent mortality<sup>16</sup> (see Table 4).

**Table 4. Weight classification by BMI<sup>16</sup>**

	Obesity class	BMI, kg/m <sup>2</sup>	Disease risk
Underweight		<18.5	Increased
Normal		18.5-24.9	Normal
Overweight		25.0-29.9	Increased
Obesity	I	30.0-34.9	High
	II	35.0-39.9	Very high
Extreme obesity	III	>40.0	Extremely high

Patients with abdominal obesity are at increased risk for ischaemic heart disease, diabetes, hypertension and some forms of cancer.<sup>36</sup> Waist circumference, measured halfway between the last rib and the iliac crest, correlates with abdominal fat mass.<sup>37</sup> In adults with a BMI of 25-34.9kg/m<sup>2</sup>, a waist circumference >102cm for men and >88cm for women is associated with an increased risk of metabolic diseases and ischaemic heart disease.<sup>16</sup>

Part of the routine examination of the obese patient should include blood pressure measurement and looking for signs of congestive cardiac failure. Urinalysis can uncover the presence of microalbuminuria, an independent risk factor for ischaemic renal and heart disease.

### Investigations

Investigations should include a baseline electrocardiogram; ischaemic changes may be revealed, which would merit further evaluation. It can also be used for future comparisons.

Blood tests should include a fasting lipid profile, oral glucose tolerance test, urea and creatinine levels, thyroid function tests and liver function tests.

Depending on clinical features, other blood tests may also be appropriate, e.g. sex hormone levels if hirsutism and/or

amenorrhoea are present, dexamethasone suppression test and 24-hour urinary cortisol level if hypertension, central obesity and/or thin skin are present. An exercise stress test should be organised if exertional chest pain is described.<sup>38</sup> Pulmonary function tests and sleep studies may be necessary in those who describe morning headaches and daytime somnolence.

## Treatment

In the US in 1998, 29% of men and 44% of women described themselves as trying to lose weight.<sup>39</sup> Despite this, however, only about 20% reported restricting caloric intake and increasing physical activity simultaneously.

If the patient is ready and willing to lose weight, a structured, goal-orientated treatment plan should be instituted. The consultation should be patient-centred, encouraging the patient to set realistic goals and expectations and express his or her own ideas for therapy with input from the healthcare professional. Provisions should be made for frequent follow up and long term contact in order to (i) monitor progress, (ii) modify the treatment plan as needed, and (iii) provide encouragement. This is particularly important during periods of patient disappointment and weight regain.

## Aims

The initial target is for 5% weight loss in the first 3 months (or a 5-10cm reduction in waist circumference).<sup>40</sup> Once this target has been achieved, an individualised plan should be agreed with the patient for reaching the 10% body weight reduction target.<sup>41</sup> Regardless of the starting weight, a 10% body weight reduction has been shown to result in a:

- 20% reduction in all-cause mortality,
- 30% reduction in diabetes-related deaths,
- 40% reduction in obesity-related cancer deaths, and
- 10mmHg reduction in systolic blood pressure.<sup>16,20-23</sup>

## Dietary intervention

Dietary intervention is the most essential facet of obesity management. A low fat diet with an average intake that is 500kcal/day less than that expended should result in weight loss of 0.45kg per week.<sup>42-45</sup> This is termed a low calorie diet (LCD) and is the recommended current practice by the National Taskforce on Obesity. The World Health Organisation (WHO) has provided a means of estimating caloric expenditure (see Table 5).

The use of standard equations is cumbersome and simple dietary guidelines may suffice (see Table 6).

**Table 5. Revised WHO equations for estimating energy expenditure**

### Step 1: estimate basal metabolic rate

Men 18-30 years	=	$(0.0630 \times \text{actual weight (kg)} + 2.8957) \times 240\text{kcal/day}$
Men 31-60 years	=	$(0.0484 \times \text{actual weight (kg)} + 3.6534) \times 240\text{kcal/day}$
Women 18-30 years	=	$(0.0621 \times \text{actual weight (kg)} + 2.0357) \times 240\text{kcal/day}$
Women 31-60 years	=	$(0.0342 \times \text{actual weight (kg)} + 3.5377) \times 240\text{kcal/day}$

### Step 2: Determine activity factor

Activity Level	Activity factor
Low (sedentary)	1.3
Intermediate (some regular exercise)	1.5
High (regular activity or demanding job)	1.7

### Step 3: Estimate total energy expenditure

Total energy expenditure = basal metabolic rate x activity factor

**Table 6. Suggested dietary caloric intake based on weight to achieve significant weight loss**

Body weight (kg)	Suggested food intake (kcal/day)
70-90	1,000
90-115	1,200
115-135	1,500
135-160	1,800
>160	2,000

The composition of the ideal or most healthful diet is not known. Dansinger et al performed a randomised trial comparing four different diets: a low carbohydrate diet; a LCD; a very low fat diet; and a glycaemic load controlled, macronutrient balanced diet.<sup>46</sup> Mean weight loss was similar for all four diets and was modest (2.1-3.3kg). Dietary adherence was low with all diets and was more important a predictor of weight loss than the specific diet. Improvements in ischaemic heart disease risk factors were related to the amount of weight loss and not to the specific diet. The LDL/HDL cholesterol ratio decreased significantly in all four diets.

It is desirable that the selection of foods used to meet a specific caloric intake has a nutrient profile that is known to reduce the risk of ischaemic heart disease. This involves the consumption of a variety of fruits, vegetables, grains, beans, fish, poultry and lean meats and limiting the intake of foods high in saturated fat and cholesterol. The elimination of alcohol, soft drinks and most sweets is also advisable, due to their lack of other nutrients besides energy.

The use of portion-controlled diets can enhance weight loss.<sup>47,48</sup> These involve the utilisation of prepackaged prepared meals such as frozen foods or liquid formula meal replacements. Obese people underestimate their actual food intake by an average of 50%.<sup>49</sup> Metz et al<sup>50</sup> and Jeffery et al<sup>51</sup> performed randomised trials which showed that providing prepackaged/prepared meals can enhance long term compliance and result in up to three times as much weight loss. This difference, however, may be due to the provision of a structured meal plan.<sup>52</sup>

Low fat diets decrease body weight and the risk of ischaemic heart disease.<sup>53,54</sup> Epidemiological and diet intervention studies suggest that increasing dietary fat increases body weight.<sup>55</sup> Diets that focus on reducing both fat and total energy intake produce more initial weight loss than those that restrict fat intake alone.<sup>56</sup> Obese people who have maintained a weight loss of >14kg for at least one year report consuming <25% of calories as fat.<sup>57</sup>

Low carbohydrate diets are safe, can reduce plasma lipid levels and are effective at bringing about short term weight loss.<sup>58-63</sup> Obese subjects do not fully make up for the loss of calorie intake, associated with carbohydrate intake restriction, with increased fat and protein ingestion.<sup>64,65</sup> These diets, however, tend to involve high quantities of dietary fat. Their use is not currently advocated by the National Taskforce on Obesity.

Very low calorie diets (VLCD) provide a dietary intake of <800kcal/day. These usually contain small amounts of fat (<15g/day) and large amounts of protein (70-100g/day). These are unsustainable and the weight regain when the diet is stopped is often rapid.<sup>66</sup> They should be reserved for subjects who require rapid weight loss for a specific purpose such as surgery. Moreover, some studies have shown no differences in initial weight loss with a VLCD compared to a LCD.<sup>67,68</sup>

In summary, a 500kcal/day deficit diet, of which <30% is composed of fat, is the most likely to bring about significant, lasting weight loss. Patients tend to underestimate their caloric intake and get frustrated at their perceived failure to achieve weight loss. The employment of portion-controlled foods is a valuable option in this setting.

## Physical activity

Physical activity is the component of treatment that is most likely to promote long term maintenance of a reduced

weight.<sup>69-71</sup> The first US National Health and Examination Survey (NHANES I) found that low levels of physical activity were strongly related to weight gain.<sup>72</sup> People who are obese and physically active or who have moderate to high levels of cardio-respiratory fitness have lower death rates from cardiovascular disease and all-cause mortality than people who are lean, sedentary and unfit.<sup>73-76</sup>

Alone, physical activity is ineffective at realising initial weight loss. Moderate exercise without simultaneous dietary intervention typically produces 2-5kg weight loss after one year.<sup>77-80</sup>

Obese people who exercise on a regular basis tend towards superior weight loss maintenance.<sup>81-83</sup> This may be due in part to improvements in mood and feeling of self-worth causing improved stimulus control.<sup>84,85</sup>

The level of physical activity required to sustain weight loss is substantial. Burning up approximately 2,500kcal/week by exercise is what is required for successful weight maintenance.<sup>86,87</sup> This is the equivalent of walking for an average of 1-1.5 hours/day or cycling or jogging for ¼ to ½ of an hour/day. This amount of exertion is not possible for most obese people to achieve in the short term. Initial activity goals, therefore, should be moderate and slowly increased over time. Electronic pedometers are useful in recording walking distances and number of steps walked (1,000 steps = 4 minutes, 15,000 steps = 60 minutes).<sup>88</sup>

As with any therapy aimed at lifestyle change, compliance is a huge stumbling block. Adherence can be improved by dividing daily exercise into multiple short bouts.<sup>89</sup> Another valuable method is to advise patients to exercise at home rather than at a gym.<sup>90-92</sup> Incorporating short periods of activity into daily schedules is also effective.<sup>93</sup>

## Behaviour modification

Behaviour modification has become a standard element of most weight loss programmes. The object of this system is to help the patient recognise and change eating habits, as well as increase physical activity levels in order to make possible successful weight loss and successful maintenance of weight loss. There are a number of different strategies that can be employed (see Table 7).

Lifestyle changes should be initially small so that incremental steps are taken to achieve larger and more distant goals.<sup>95</sup>

Patients treated by a comprehensive group behaviour therapy programme lose approximately 9% of their initial weight in 20 weeks and, without further treatment, maintain a loss of 5% one year later.<sup>96</sup>

Regular biweekly contact by telephone, postcards or in clinic visits helps maintain weight loss.<sup>97,98</sup> The use of the internet and e-counselling has also been shown to help weight maintenance.<sup>99</sup>

A structured, legitimate commercial programme such as

**Table 7. Principles of behaviour modification therapy**

Principle	Example	Comment
Development of realistic and specific goals	<ul style="list-style-type: none"> <li>Walking for 20 minutes, 3 times per week</li> <li>Eating only at the table</li> </ul>	Facilitates assessment of goal attainment and the initiation of targeted problem solving
Creation of a reasonable strategy to attain goals		<ul style="list-style-type: none"> <li>Encourages identification of factors that facilitate goal realisation</li> <li>Helps develop further strategies likely to be successful</li> </ul>
Self-monitoring	Diary of daily food intake and physical activity levels	Correlates with successful weight control and decreases tendency to underestimate food intake <sup>94</sup>
Stimulus control	Avoiding triggers that prompt eating such as watching television	
Social support	Using a 'buddy' to encourage and assist implementation of planned behavioural changes	
Cognitive restructuring	<ul style="list-style-type: none"> <li>Positive problem solving approach</li> <li>Identifying and correcting irrational thoughts that undermine efforts</li> </ul>	Helps avoid feelings of failure, which can lead to weight gain

Weight Watchers is a viable and effective alternative for those finding access to a behaviour modification programme problematic.<sup>100</sup> Programmes such as these involve weight graphs and food records, thus providing objective evidence of weight loss efforts and success.

### Pharmacotherapy

Obese patients (BMI >30kg/m<sup>2</sup>) and overweight patients (BMI 27.0-30kg/m<sup>2</sup>) with co-morbidities are candidates for pharmacotherapy should they fail to lose >5% body weight after three months. Co-morbidities include ischaemic heart disease, ischaemic heart disease risk factors and obesity-related diseases. Pharmacotherapy should also be considered for overweight patients who have: (i) a high waist circumference

(>102cm for males and >88cm for females); (ii) gained >5kg since the age of 18-20 years; and (iii) poor aerobic fitness.

Sibutramine and orlistat help initiate and maintain weight loss in those also involved in efforts to change eating and activity behaviours.<sup>101,102</sup> Their method of action and side effect profile are outlined in Table 8. Their effect is modest.

Pharmacotherapy alone is not as effective as pharmacotherapy given in conjunction with a comprehensive weight management programme.<sup>101,103,104</sup>

Pharmacotherapy can double to triple the rates of significant weight loss and weight maintenance, but does not reduce weight *ad infinitum*.<sup>101,102</sup> Medications have been shown to increase the mean weight loss by up to four-fold.<sup>105,106</sup> They are likely to be required long term, if not lifelong, because patients who respond

**Table 8. Sibutramine and orlistat**

Drug name and type	Method of action	Side effects — mild and transient
<b>Sibutramine</b> - monoamine (noradrenaline, serotonin and dopamine) reuptake inhibitor	<ul style="list-style-type: none"> <li>works mainly in hypothalamus</li> <li>anorexiant — increases satiation thereby decreasing food intake</li> </ul>	<ul style="list-style-type: none"> <li>Dry mouth</li> <li>Headache</li> <li>Constipation</li> <li>Insomnia</li> <li>Hypertension (2-4mmHg)</li> </ul>
<b>Orlistat</b> - inhibitor of dietary fat absorption	Binds to gastrointestinal lipases in the gut preventing hydrolysis of dietary triglycerides into absorbable free fatty acids and monoacylglycerols	<ul style="list-style-type: none"> <li>Steatorrhoea</li> <li>Increased stool frequency</li> <li>Faecal urgency and incontinence</li> <li>Abdominal pain</li> <li>Flatulence</li> </ul>

to drug therapy usually regain weight when the therapy is stopped.<sup>102,107</sup> Some patients are refractory to drug therapy.<sup>108,109</sup> Discontinuation of treatment should be considered if a patient does not respond to pharmacotherapy within four weeks.

### Sibutramine

Smith and Goulder<sup>105</sup> and McMahon et al<sup>106</sup> performed prospective one year randomised placebo-controlled trials assessing the effectiveness of sibutramine in weight loss and maintenance. In both trials, three to four times the number of subjects randomised to sibutramine made significant weight losses. Of the subjects treated with sibutramine, approximately 50% lost >5% of their initial body weight and approximately 25% lost >10% of their initial body weight. This compares with those treated with placebo of whom 15% lost >5% of their initial body weight and approximately 5% lost >10% of their initial body weight. The mean weight loss was four times greater in the sibutramine group (approximately 5% of initial body weight).

In those following a reduced calorie diet and receiving sibutramine, a 5-8% loss of their pre-intervention body weight is typical.<sup>110-112</sup> Apfelbaum et al<sup>113</sup> showed that the effectiveness of sibutramine can be increased threefold by the concurrent use of behaviour modification and a structured meal plan.

Sibutramine has a role to play in long term weight management after initial weight loss. It can bring about further significant weight loss<sup>113</sup> and increase the incidence of weight loss maintenance (80% vs 40% of patients at two years).<sup>102</sup>

Among obese subjects treated with sibutramine, weight loss is associated with a decrease in plasma lipid and uric acid levels, as well as an improvement in glycaemic control and insulin sensitivity in patients with type II diabetes.<sup>102,106,108,111</sup>

### Orlistat

Orlistat brings about a 33% increase in the incidence of patients achieving a weight loss of >5% of their initial body weight (approximately 60%) and doubles the incidence of those losing >10% of their initial body weight (approximately 35%).<sup>101,104,114-6</sup> The mean weight loss of those treated with orlistat is typically about 9% of initial body weight. In those taking orlistat, dietary intervention and behaviour modification therapy is associated with an higher incidence of achieving and maintaining weight loss goals (34% vs 10% of subjects).<sup>114,115</sup>

Orlistat is also effective at maintaining weight loss.<sup>101,107,110,111,117</sup> Orlistat also halves the amount of weight regained during the second year of obesity therapy (35.2% of weight lost vs 62.4% with placebo).

In long term studies, orlistat-treated patients also had moderate decreases in diastolic blood pressure, fasting plasma insulin levels and plasma lipid levels.<sup>101,114</sup> Orlistat also improves glycaemic control and decreases sulphonylurea requirements in those with type II diabetes.<sup>118</sup>

The evidence to date would suggest that orlistat is not as effective as sibutramine in maintaining diet-induced weight loss.<sup>107,117</sup>

## Bariatric surgery

Bariatric surgery is the most effective approach for achieving a reduction in the morbidity and mortality associated with severe obesity.<sup>119-122</sup>

The United States National Institutes of Health (NIH) Consensus Development Panel in 1991 established the indications for the surgical treatment of obesity.<sup>123</sup> A recent meta-analysis has supported its indications.<sup>124</sup> Those with a BMI >40kg/m<sup>2</sup>, who are well informed and motivated, who have failed previous attempts at non-surgical weight loss and who are able to comply with long term treatment and follow up are deemed potentially eligible candidates. Similar candidates with a BMI >35kg/m<sup>2</sup> who have serious co-morbidities such as severe diabetes, obstructive sleep apnoea syndrome, heart failure or joint disease should also be considered.

Buchwald et al<sup>119</sup> performed a meta-analysis of 136 studies (22,094 patients) looking at the effect of bariatric surgery on mortality and obesity co-morbidities. Their findings were significant (see Table 9).

**Table 9. Effectiveness of bariatric surgery<sup>119</sup>**

Parameter	Result
Mean percentage excess weight lost	61.2% overall 47.5% for gastric banding 61.6% for gastric bypass
30-day mortality	0.1% for gastric banding 0.5% for gastric bypass
Diabetes	76.8% resolution 86.0% resolution or improvement
Hyperlipidaemia	70% improvement
Hypertension	61.7% resolution 78.5% resolution or improvement
Obstructive sleep apnoea syndrome	75.7% resolution 83.6% resolution or improvement

Approximately 75% of deaths are caused by anastomotic leaks and peritonitis and 25% by pulmonary embolism.

Quality of life<sup>125</sup> and mental health<sup>126</sup> can be dramatically improved in obese patients treated by bariatric surgery.

Christou et al<sup>122</sup> performed a population-based observational two-cohort study looking at the effect of bariatric surgery on long term mortality. The treatment cohort included 1,035 patients who had undergone bariatric surgery. The control group comprised 5,746 age- and gender-matched severely obese patients who had not undergone bariatric surgery. The mortality rate in the bariatric surgery cohort (0.68%) was significantly

lower than in the control population (6.17%), which translated into a reduction in the relative risk of death by 89%.

Bariatric surgery needs to be performed in a centre where an integrated, comprehensive pre-operative and follow up plan can be drawn up by nutritional, behavioural, medical and surgical experts.<sup>127</sup> This allows exclusion of inappropriate surgical candidates and the provision of counselling regarding post-operative lifestyle, diet and weight loss expectations. Untreated major depression, psychosis, binge eating disorders and substance abuse are all contraindications to surgery due to the risk of adverse outcome. After surgery, patients should consume >1.5l of fluid/day, ingest high protein foods and take vitamin and mineral supplements.

The two most commonly performed types of bariatric procedure are laparoscopic adjustable gastric banding and the Roux en Y gastric bypass (RYGB).

### Laparoscopic adjustable gastric banding (LAGB)

LAGB involves placing a tight, adjustable silicone band around the upper stomach, just distal to the gastro-oesophageal junction. Intake of solid food is thus restricted. A balloon within the band is connected to an infusion port placed in the subcutaneous tissue. The band circumference size can be changed by percutaneously inflating or deflating the balloon resulting in an altered degree of restriction (see Figure 1).



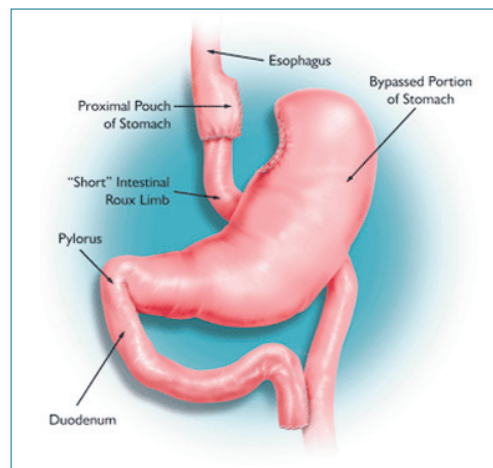
**Figure 1. Laparoscopic adjustable gastric banding**

LAGB is technically simpler and has lower complication rates than more involved procedures such as the RYGB. LAGB brings about a more gradual weight loss than gastric bypass procedures. Some 45-75% of excess weight is lost after two years.<sup>128-132</sup> This approximates to 20-35% loss of initial body weight. LAGB is also associated with improvements in quality of life and major reductions in the severity of various comorbidities including diabetes, asthma, obstructive sleep apnoea syndrome and hypertension.<sup>133-138</sup>

### Roux en Y gastric bypass (RYGB)

RYGB involves the construction of a small (<30ml) proximal gastric pouch, which empties via a tight stoma into a segment

of jejunum that is anastomosed to the pouch as a Roux en Y limb (see Figure 2).



**Figure 2. Roux en Y gastric bypass**

Like LAGB, the RYGB acts, via the small pouch and the tight outlet, to restrict the intake of solid food. Dumping syndrome often occurs after RYGB because ingested food traverses directly from the gastric pouch into the jejunum. This may also play a role in weight loss. Flushing, nausea, abdominal pain and diarrhoea can occur when a large volume of food or energy-dense liquids is ingested post-operatively. This may serve as a negative conditioning response.<sup>139</sup> Bypassing the stomach and duodenum and shortening the functional small bowel length causes a decrease in the effectiveness of nutrient absorption, which probably also contributes to the profound weight loss seen post-operatively.

Average excess weight loss after RYGB is between 50% and 75% after two years.<sup>140,141</sup> This approximates to 25-30% loss of initial body weight. RYGB also brings about improvement and/or resolution of co-morbid conditions including diabetes, obstructive sleep apnoea syndrome, hypertension and hyperlipidaemia.<sup>140,141</sup>

### Summary and conclusions

Like any chronic serious condition, obesity management requires continuous care. Lifestyle changes in the form of dietary intervention, physical activity and behaviour modification must be incorporated into any treatment programme. The option of pharmacotherapy should be borne in mind for those who fail to meet their weight loss targets if they are significantly overweight with a high mortality risk or are obese. Sibutramine and orlistat have been proven to moderately increase the likelihood and quantity of weight loss. Surgery is a very effective means of obesity management, but is associated with a significant mortality risk. It should only be considered for those who are extremely obese or for those whose mortality risk outweighs the risk of surgery.

References available on request from  
tilsley@eireannpublications.ie