



of 27 or more and increase with increasing levels of BMI. Risks associated with increased BMI are more pronounced in older patients.

Waist circumference or WHR or both are often used to indirectly estimate intra-abdominal fat volume in epidemiologic studies. Although these measures show good correlation with intra-abdominal fat volume as measured by CT, they are less accurate than CT. At present, waist circumference is the easiest anthropometric measurement for routine use by health care professionals to estimate visceral adiposity and monitor changes in visceral fat volume.

The current gold standard techniques for measuring visceral fat volume are abdominal CT (at the L4-L5 vertebral level) and MRI. These methods are not widely used because of high cost and radiation exposure. In contrast to CT, MRI requires additional definition of adipose tissue by adjusting settings on the MRI scanner. Several commercial software packages are available for calculation of visceral fat volume, and it is possible to further subdivide body fat into at least three separate and measurable compartments: subcutaneous, intramuscular, and visceral fat.

Visceral fat volume determination by abdominal ultrasonography has been investigated for use in research and clinical settings. Several studies found good correlation between intra-abdominal fat volume measured by abdominal ultrasound and that measured by abdominal CT scanning. Measurements should be performed with the patient in the supine position at the end of a quiet inspiration with compression of the transducer against the abdomen. Intra-abdominal fat is quantified based on the distance between the peritoneum and the lumbar spine. Studies have shown that intra-abdominal fat measured by ultrasound has a stronger association with metabolic risk factors for CAD than does waist circumference or WHR. Recently, visceral fat has been measured using bioelectric impedance, but this technique is less accurate than CT.

TREATMENT OF OBESITY

Current guidelines for treatment of obesity are summarized in Table 67-1. The preferred intervention varies with the obesity level based on five BMI categories. The major four therapeutic options are lifestyle modification (diet and exercise), behavior modification, pharmacologic intervention, and bariatric surgery. In general, better results are obtained with a combination of different interventions rather than a single modality.

Lifestyle Modification

Key components of effective lifestyle modification most often include structured dietary interventions and individualized

physical activity programs. Behavior modification strategies and patient education are also critical for achievement and maintenance of target weight loss. Evidence-based dietary guidelines should be used to design individualized patient plans in consultation with a registered dietitian or qualified health care provider. First, daily caloric intake should be reduced by a modest 250 to 500 calories. Reasonable and paced reductions can help patients continue on the recommended dietary plan for a longer time. Daily calories from carbohydrate should be reduced to approximately 40% to 45% of intake, with a total daily carbohydrate intake of no less than 130 g/day. Except in patients with renal impairment (creatinine clearance <60 mL/min) or significant microalbuminuria, protein intake should not be less than 1.2 g/kg of adjusted body weight (adjusted body weight = ideal body weight + 0.25 [current weight – ideal body weight]). This typically accounts for 20% to 30% of total calorie intake and is intended to minimize loss of lean body mass during weight reduction. The remaining 30% to 35% of calorie intake should come from fat. *Trans*-fats should be eliminated, and saturated fat should be reduced to less than 7% of total calorie intake. Meal plans should also include substantial soluble fiber (e.g., from fresh fruits and vegetables) and consumption of healthy carbohydrates, especially foods that are high in fiber and have a low glycemic index. Approximately 14 g of fiber per 1000 calories (20 to 35 g of fiber) per day is recommended.

Caloric intake should be adjusted downward over time until weight loss is achieved. Underlying all of these steps should be the goal of designing an individualized plan that can be maintained over the long term. Many patients find it helpful to receive a structured dietary intervention that includes specific suggestions for daily meals. Such structured diets may increase adherence and can be easier to follow than a list of general guidelines. Nutritionally complete meal replacement (e.g., in the form of shakes or bars) can be useful for some patients, especially at the start of a weight reduction program. If meal replacement is used, 100- to 200-calorie snacks (e.g., fruits and nuts) may be added at breakfast, lunch, or between meals.

Each patient should meet with an exercise physiologist to construct an individualized plan that is responsive to his or her lifestyles, capabilities, and potential cardiovascular risks. Because obese individuals frequently have difficulty exercising, this process requires careful attention. A balanced exercise plan incorporates a mix of cardiovascular, stretching, and strength exercises and should be graded to increase gradually in both duration and intensity. Patients can start with 10 to 20 minutes of daily stretching and aerobic exercise (e.g., moderate-intensity walking) with subsequent progressive increases. Any exercise

TABLE 67-1 GUIDE TO SELECTING TREATMENT BASED ON BMI CATEGORY*

TREATMENT	BMI CATEGORY				
	25-26.9	27-29.9	30-34.9	35-39.9	≥40
Diet, physical activity, behavior therapy	Yes with comorbidities	Yes with comorbidities	Yes	Yes	Yes
Pharmacotherapy		Yes with comorbidities	Yes	Yes	Yes
Weight-loss surgery			Yes with comorbidities	Yes with comorbidities	Yes with comorbidities

From National Institutes of Health (NIH), National Heart, Lung, and Blood Institute (NHLBI), North American Association for the Study of Obesity (NAASO): The practical guide to the identification, evaluation, and treatment of overweight and obesity in adults. NIH Publication No. 00-4084, Bethesda, Md., October 2000, NIH. http://www.nhlbi.nih.gov/files/docs/guidelines/prctgd_c.pdf. Accessed November 2014.

*“Yes” indicates that the treatment is indicated regardless of comorbidities.