

“Morbid” obesity: a hazardous disorder that resists conservative treatment^{1, 2}

Theodore B. Van Itallie, M.D.

The expression “morbid obesity” was coined by Payne and DeWind in 1963 (J. J. Payne, personal communication) in order to persuade health insurance administrators that reimbursement for the cost of intestinal bypass surgery in grossly obese patients could be justified on health grounds. The word “morbid” derives from the Latin “morbidus,” which means diseased but, ironically, it is also related to the Greek term “marainein” which means “to waste away” (1). Despite this discordant etymological note and the fact that the word “morbid” prejudices the case, use of this adjective is usually appropriate since very severe obesity qualifies as a disease *per se* and is conducive to many other maladies as well.

Bray (2) has compiled data on 16 cases of extraordinary obesity whose maximum weight averaged 811 lb (369 kg) and whose average age at time of death was 35 years (range 22 to 59). Obviously, obesity this extreme is associated with a greatly diminished life span, but there remain many valid questions about the relationship between degree of severity of obesity and health expectations. Such questions must be addressed if we are to attempt to balance the risks of inherently hazardous (but potentially successful) treatments of morbid obesity against the risk of permitting the obesity to continue unchanged.

The three largest surveys (3–5) that have linked life expectancy to variations in weight do not provide specific information about the excess mortality that might be anticipated for individuals who are more than 60% overweight. However, the data from these studies that, in aggregate, involved 10,250,000 persons, strongly suggest that excess mortality accelerates rapidly among men and women as their overweight becomes increasingly severe (Fig. 1). Thus, if we categorize individuals who are 100% or more overweight as being morbidly obese, it becomes evident that

this degree of obesity carries with it a greatly enhanced risk of premature death. It should be pointed out that the mortality studies of insured populations probably have understated the death rates among severely obese persons because they excluded individuals in this category who were diabetic, hypertensive, or suffering from other cardiovascular disorders. Mention also should be made of the fact that in insured cohorts, relative mortality among overweight males is appreciably higher than that among comparably overweight females. This difference is not found in studies of the general population (4). Extrapolation to higher degrees of overweight from the pooled data on insured populations (3, 5) leads one to estimated excess mortality figures that are not inconsistent with those obtained by Drenick et al. (6) when they calculated the mortality ratios of 200 morbidly obese men. These workers found that in the group aged 25 to 34 years the mortality ratio was almost 12 times that of nonobese men in the same age category. Excess mortality decreased with advancing age, being almost 6 times normal in the group aged 35 to 44 and about three times normal in the group aged 45 to 54.

What do severely obese people die from? Principally from heart disease, stroke, and diabetes mellitus. Some preliminary data (Fig. 2) about the relationship of excess weight to cause of death in men are available from the 1959–1973 study conducted by the American Cancer Society (4). Again, data for the morbidly obese are lacking, but there is reason to believe that as excess mortality increases with increasing overweight, a simi-

¹ From the Department of Medicine and Institute of Human Nutrition, College of Physicians and Surgeons, Columbia University, and St. Luke's Hospital Center, New York, N.Y. 10025.

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"MORBID" OBESITY

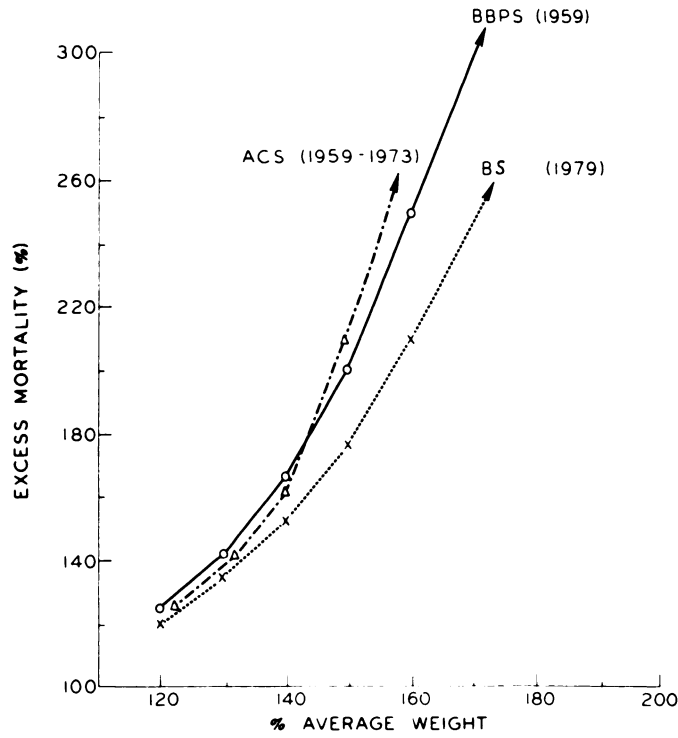


FIG. 1. Acceleration of excess mortality among men and women as their overweight becomes increasingly severe. The segments of the lines beyond 140% of average weight in the case of the ACS study (4) and beyond 160% in the Build and Blood Pressure Study (BBPS) 1959 (3) and the Build Study (BS) 1979 (5) are extrapolations.

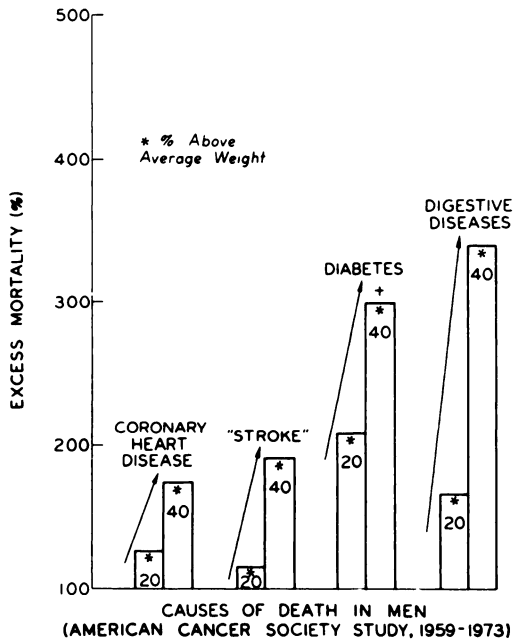


FIG. 2. Relation of excess weight to cause of death in men (4).

lar distribution of causes of death would obtain.

The literature on the medical complications of severe obesity has become fairly sizable, but such articles are frequently case reports and the public health implications of such information are difficult to assess. The kinds of health problems to which morbidly obese persons are believed to be especially susceptible include those shown in Table 1. Problems that are not unduly threatening to physical health or quality of life, such as menstrual irregularities and dermatoses, are not included in this list.

Unanimity does not exist concerning the hazard to life of gross obesity. Keys (7) has pointed out that persons with moderately severe obesity who are free of such risk factors as hypertension, cigarette smoking, and hypercholesterolemia may not have the increased risk of coronary heart disease and premature death suggested by the lugubrious data shown earlier. However, neither Keys nor any other investigator has provided reli-

TABLE 1
Some conditions associated with morbid obesity

| |
|--|
| High risk of coronary heart disease |
| Increased mortality associated with myocardial infarction |
| Hypertension (exacerbated by increasing obesity) |
| Diabetes mellitus (exacerbated by enlarging adipocytes) |
| Gallbladder disease |
| Cardiorespiratory dysfunction |
| Hypervolemia |
| Increased left ventricular filling pressure |
| Obesity hypoventilation syndrome ^a |
| Cor pulmonale |
| Circulatory congestion |
| Osteoarthritis of weight-bearing joints |
| Particularly knees and back |
| Psychosocial incapacity |
| Thromboembolic disease with pulmonary emboli |
| Operative risks |
| Anesthesia and operation more dangerous |
| Pulmonary function compromised |
| Increased risk of: |
| Wound infection |
| Wound dehiscence |
| Late hernia formation |
| Thrombophlebitis and pulmonary embolism |
| Thrombosis of the renal veins and vena cava |
| Nephrotic syndrome |
| Cardiomegaly |
| Abnormalities of liver function and morphology |
| Uterine fibroid and carcinoma of endometrium |
| Venous stasis in lower extremities |
| Stasis ulcers |
| Thrombophlebitis and pulmonary embolism |
| Interference with diagnosis of: |
| Breast cancer |
| Ovarian tumor |
| Mediastinal masses (sometimes confused with mediastinal lipomatosis) |

^a Obstructive sleep apnea is a separate syndrome that can occur in mild obesity.

able information about the proportion of morbidly obese individuals who are free of risk factors for coronary heart disease and premature death. Moreover, it is clear from a recent report by Kannel and Gordon (8) on the risks and hazards of obesity in Framingham, Mass., among men, aged 50 to 59, that the incidence of sudden death significantly increased after their relative weight exceeded 129%. In addition, they pointed out that, "because it reversibly promotes atherogenic traits like LDL (low density lipoproteins), low HDL (high density lipoproteins), diabetes, and hypertension, correction of overweight is probably the most important hygienic measure (aside from avoidance of cigarettes) available for the control of cardiovascular disease."

Assuming that morbid obesity is a dangerous condition that clearly and sometimes urgently calls for correction, one must ask what the prospects are for success with the various nonsurgical treatments. Unfortunately, no categorical answers to this question are available; however, the overall picture at present is not encouraging.

Wing and Jeffery (9) reviewed the results of outpatient treatment of obesity conducted between 1967 and 1977 (Table 2). The 112 studies that they located lasted from 10 to 40 weeks, with total mean weight losses varying between 9.7 and 18.4 lb. Rates of weight loss ranged from 0.3 to 1.86 lb/week. At such rates it might take 2 years of continual rigorous dieting before a morbidly obese person could return to his desirable weight. However, morbidly obese individuals have lost weight much more rapidly on more drastic regimens such as prolonged fasting and prolonged supplemented fasting. Drenick (10) has reported that weight loss in the absence of food averages at least 1 lb a day in a 300 lb subject who fasts for 2 months. Losses are greatest in the heaviest subjects; thus, in Drenick's series, one patient weighing 540 lb lost 71 lb in the first month and 40 lb in the second month. Among 11 men of differing initial weights who fasted for 1 to 4 months, the mean weight loss was 65 lb.

Subsequent weight data were obtainable in 121 subjects of an original group of 207, covering a mean follow-up period of 7.3 years (11). Of the 121 patients who were available for follow-up, 50% regained their lost weight in 2 to 3 years, while more than 90% had reverted to or even exceeded their original admission weights within 9 years. In Figure 3, taken from Johnson and Drenick (11), is shown the percent of patients remaining at

TABLE 2
Results of outpatient treatments of obesity^a
(1967-1977)

| | Studies located | Mean duration of treatment | Mean weight loss | Studies with follow-up |
|--------------------|-----------------|----------------------------|------------------|------------------------|
| | | wk | lb | % |
| Diet | 9 | 9.9 | 18.4 | 22 |
| Drug | 56 | 11.2 | 11.2 | 5 |
| Behavioral therapy | 42 | 10.3 | 9.7 | 62 |
| Exercise | 5 | 40.0 | 11.2 | 0 |

^a From Wing and Jeffery (9).

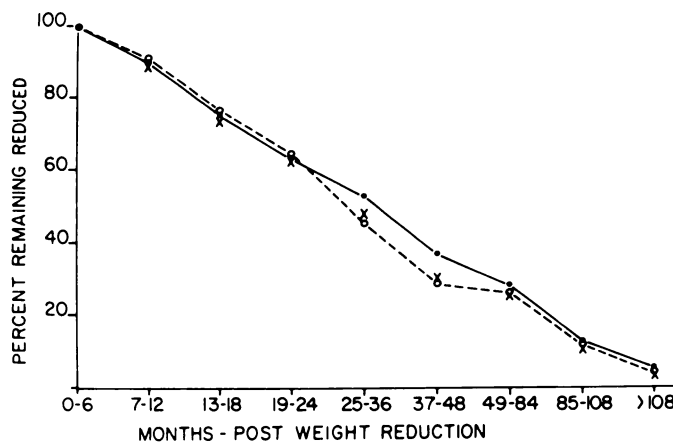


FIG. 3. Percent of 121 morbidly obese patients remaining at reduced weights at various time intervals after therapeutic starvation-induced weight loss. The solid line represents subjects with obesity that began before the age of 21, the broken line, subjects with maturity-onset obesity. \times represents mean experience. From Johnson and Drenick (11).

reduced weights at various time intervals after their accomplished weight loss. As can be seen, the rate of regain was quite uniform regardless of baseline weight, degree of weight loss, length of fast, or duration of obesity.

As Drenick (10) has pointed out, the fact that only a very small number of patients could maintain their reduced weight supports the impression of most observers that a reduction to desirable weight does not of itself provide a sufficient basis for resisting the temptation to resume well-established patterns of eating. He also calls attention to the fact that many of the fasted subjects had been unemployed for years and may have lacked the "motivation" to remain less obese; moreover, after completion of weight loss, almost all of the patients were set adrift and were not provided with any incentive to participate in a weight maintenance program.

Other regimens, short of total starvation, have been successful in removing substantial quantities of weight from massively obese individuals. Notable among these are the rice-reduction diet used by Kempner and his associates (12) and the variants of supplemented fasting utilized by Blackburn et al. (13), Vertes et al. (14), and McClean Baird et al. (15).

In 1975 Kempner et al. (12) reported on their experience with 106 outpatients who had lost at least 45 kg on a low-sodium weight reduction diet that provided from 400 to 800

kcal/day, with 90 to 95% of the calorie intake from carbohydrates, primarily as rice and fruits. The average weight loss of this group was 64 kg and the maximum 137 kg. The mean relative weight of the subjects was 160% before treatment and 126% at the end of the weight loss period. The group as a whole demonstrated significant decreases in systolic and diastolic blood pressures, fasting and postprandial blood glucose levels, heart size, serum triglycerides, and serum uric acid. Among 21 patients in whom serum cholesterol concentrations were elevated, there was a mean decrease in cholesterol of approximately 28 mg/100 ml. Forty-five of the patients had abnormal electrocardiographic findings on initial examination; only six continued to have cardiac abnormalities after weight loss.

Unfortunately, no follow-up report on this group of 106 patients is yet available; moreover, its members appear to have been selected for their successful weight loss performance and there is no information concerning the subjects who failed to do as well.

Substantial weight losses also have been reported by Genuth et al. (16) for subjects consuming 300 kcal/day, by Blackburn et al. (13) for subjects consuming 1.0 to 1.5 g protein/kg desirable weight as virtually the sole source of calories, and by Howard and McClean Baird (17) for subjects consuming diets providing 180 to 320 kcal/day.

Of 52 subjects studied by Howard and

McClellan Baird (17), one individual whose initial weight was 189 kg lost 66.1 kg over a 39-week treatment period. Only four of the 52 subjects lost more than 30 kg (mean loss 32.1 kg). These four remained on the diet for an average of 23 weeks.

In a group of 111 obese outpatients studied by Blackburn et al. (13) during 1973 to 1974, 12.6% were successful in losing more than 60 lb; however, information was not provided about the initial weights of these individuals.

Recently, Bistrian and Sherman (18) reported data concerning weight regain of a group of patients who had adhered to a protein supplemented fast for an average of 11.9 months. All of the subjects had received 1.5 g protein/kg desirable weight as meat, fish, or fowl during this period. The 31 study patients averaged 30 years of age and their mean pretreatment relative weight was 170%. Mean weight loss at the time the patients left the program was 25 kg.

Of the 36 patients who entered the program, 31 were available for long-term evaluation. One subject was lost to follow-up 2 years after treatment ended, 2 after 3 years, and 2 after 4 years. Because the patients entered the program at different times, the duration of the follow-up varied from 12 to 54 months. Data were available on 20 subjects followed for 2 years past therapy, 13 subjects followed for 3 years, and 10 subjects followed for 4 years. Of all these subjects, about one-third maintained a weight loss of 40 lb or more during their respective follow-up periods. The five patients who could not be contacted were considered as failures when the results were being tabulated.

Genuth and Vertes (19) reported that of the first 75 obese outpatients studied on their regimen of 300 kcal/day, 47 were successful in losing at least 2 lb/week for at least 8 weeks. Initially, this group had a relative weight averaging about 200%. The 28 women members lost an average of 72 lb while the men lost an average of 91 lb. Average duration of adherence was about 20 weeks. In individual instances in this series, there was relief of dyspnea, marked improvement in diabetes, normalization of elevated blood pressure, and facilitation of needed prosthetic or vascular surgery.

Detailed follow-up data on the patients treated by Genuth and co-workers are not

presently available; however, these workers have found it exceedingly difficult to keep more than one-third of their successfully weight-reduced patients in a weight maintenance program. Apparently, about one-half of this residual group has been able to maintain posttreatment weight for about 2 years. Thus, at rough estimate, the 2-year recidivism rate of patients studied in Cleveland could be as high as 80%.

On the basis of such information as is currently available, it is evident that the conventional modalities of outpatient treatment for obesity, namely, a low-calorie balanced diet, anorectic drugs, behavioral therapy, and exercise, have little or nothing to offer the majority of morbidly obese patients, either singly or in combination. Setting aside questions concerning the safety of prolonged fasting or of very low caloric diets (including the rice diet), one can conclude that, on the average, morbidly obese individuals can be expected to lose from 14 to 41 kg, if they are willing to fast for periods of time ranging up to 3 months (9). It is not clear how many such persons will be able to maintain their weight loss indefinitely if they are provided with assiduous follow-up care, including behavioral therapy. Similarly, markedly obese persons who remain on a variety of very low calorie diets that are also inflexibly monotonous can lose up to 60% of their excess weight if they are willing to adhere faithfully to such a regimen for prolonged periods of time. It would seem that somewhere between 30 and 60% of markedly obese patients who are willing to enter a supplemented fasting program can achieve this degree of weight loss; however, it is not known what proportion of successful losers can maintain their new weight for an indefinite period of time.

As has already been mentioned, the physical health benefits associated with successful weight loss are often dramatic and impressive. And apart from these health advantages, the quality of life often improves remarkably when a substantial quantity of weight is lost. Reemployment is facilitated and earnings increase. Also, the ability of the patient to have a more satisfying social life is greatly enhanced.

In summary, there appears to be little room for doubt that morbid obesity is inimical to health, well-being, and long life. The degree



of excess mortality associated with morbid obesity can only be extrapolated from the mortality experience of persons with lesser degrees of overweight; however, as was mentioned earlier, there is preliminary evidence (6) that, depending on age, sex, and other circumstances, the death rate of morbidly obese individuals may be 3 to 12 times that of persons of the same sex and age who are within their desirable weight range.

Whether the disposition of obese individuals to relapse after weight loss reflects an inability to change learned eating habits or, rather, results from the fact that they are biologically programmed to maintain a disproportionately large fat depot, is not known. Experience with the genetically obese Zucker rat indicates that both constitutional and environmental (dietary) factors can contribute in an additive fashion to the striking obesity that these animals are capable of achieving (20).

At the present time, we do not know whether morbidly obese patients are biologically destined to be obese, but the adipocyte hypercellularity exhibited by these individuals suggests strongly that they are constitutionally predisposed to store a much larger than normal quantity of fat. Regardless of the causes of morbid obesity, it is likely that, for all practical purposes, a high proportion of morbidly obese patients is medically incurable, given the current state of therapy. Accordingly, it is appropriate to inquire whether surgical treatment has more to offer patients with resistant morbid obesity than medical treatment. If there is reason to believe that this is the case, we must then ask which type of surgical procedure is preferable and how the risks entailed can be justified.



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