Difficult Decisions

When to advise surgery for severe obesity

J.S. Garrow

Rank Department of Human Nutrition, St Bartholomew's Hospital Medical College, Charterhouse Square, London EC1M 6BQ, UK.

The term 'obesity' is used to describe two conditions: first, the excess storage of fat to an extent which significantly decreases life expectancy, and which has been described as 'one of the most important medical and public health problems of our time'¹; and second, that degree of plumpness which, although it has no measurable effect on health, is unacceptable for cosmetic reasons, especially to young women. Since this paper is about severe obesity only the former problem will be considered. To qualify for the diagnosis of severe obesity an individual must have a Quetelet's Index² or body mass index³ greater than 35, and probably greater than 40. This index is obtained by calculating W/H^2 , where W is body weight (kg) and H is height (m). A person who was 1.73 m tall would have a W/H^2 of 35 if he weighed 105 kg, and of 40 if he weighed 120 kg. The upper limit of the desirable weight of such a man is about 75 kg, so severe obesity is associated with excess weight of at least 30 kg, and probably more than 45 kg. Among the adult population in the UK between 16 and 60 years old about 1% of men and 2% of women are more than 30 kg overweight, and about 0.1% of men and 0.3% of women are more than 45 kg overweight.⁴

Energy balance in obesity

The excess weight in obese people is about 75% fat and 25% fat-free tissue.⁵ Since the energy density of fat is 9000 kcal/kg, and that of fat-free tissue averages about 1000 kcal/kg, the mixture in excess weight has an energy value of 7000 kcal/kg. If we take the person who is 50 kg overweight as a typical example of the severely obese patient the excess energy stores amount to 350,000 kcal. If somehow it can be arranged that energy output exceeds energy intake by 1000 kcal/day for a year, then the problem is solved. Initially such a patient would probably have a total daily energy expenditure of about 2500–3000 kcal/day, so the

appropriate energy intake would be 1500–2000 kcal/day. However, with weight loss, energy requirements for weight maintenance also decrease, but not to an excessive amount.⁶ By the time the year was up and weight was about 75 kg energy requirements would probably have fallen to around 2000–2200 kcal/day, so to achieve an energy deficit of 1000 kcal/day it would be necessary to restrict energy input to 1000–1200 kcal/day. Of course with a smaller daily energy deficit weight loss would still be achieved, but at a slower rate.

When a calculation of this sort is presented to a severely obese patient the response is often that the proposed rate of weight loss is unacceptably slow, and that it is unrealistic to expect someone to keep strictly to a diet for such a long time. Is it not possible to achieve the weight loss in a shorter time, and is there some surgical procedure which would be preferable to merely dieting? The remainder of this article will be devoted to an attempt to answer those two questions.

Optimum rate of weight loss in obese patients

The maximum possible rate of weight loss is achieved during complete starvation; typically a rate of about 3 kg/week is achieved during prolonged starvation, and even higher rates at the start of a period of starvation. Obviously starvation generates the greatest possible energy deficit, because energy intake is zero, but this is not the whole explanation for the rapid weight loss. If the weight lost is 75% fat and 25% fat-free tissue then a rate of weight loss of 3 kg/week implies an energy deficit of 3000 kcal/day, which is implausible, since energy expenditure is unlikely to be as high as 3000 kcal/day in a starving subject. Furthermore nitrogen (N) balance studies show that, typically, starving subjects lose about 15 gN/kg weight lost.⁷ This implies that about half the weight lost is fat and the other half is fat-free mass. The calculations then indicate an energy value of 5000 kcal/kg, so only 15,000 kcal/week, or about 2150 kcal/day deficit would be needed to explain the weight loss of 3 kg/week. Empirically it has been found that a rate of

Correspondence: Professor J.S. Garrow, Ph.D., M.D., F.R.C.P.

Received: 28 July 1988

weight loss about 1 kg/week in the long term is associated with the correct ratio of fat to fat-free tissue in the weight lost.⁸ So the answer to the question: Can weight loss be achieved in a shorter time? is: Yes, but only by sacrificing too much lean tissue. Thus, return to normal weight does not mean return to normal body composition, and if at reduced weight the ex-obese patient has too small a fat-free mass he will have too low a resting metabolic rate and hence unnecessary difficulty in maintaining the reduced weight.

Surgical options for the treatment of severe obesity

Operations for obesity fall in to three categories, which can be dealt with in turn.

Excision of fat

This cannot be seriously considered as a treatment for severe obesity. It is clearly impossible to resect all of the 50 kg excess adipose tissue, and operations which remove, say, 5 kg from the abdominal wall merely expose the patient to the risks of surgery, anaesthesia, and poor wound healing without making a significant contribution to curing the obesity. There is no sound basis for the idea that removal of fat cells by surgery prevents local recurrence of fat: if necessary new fat cells will develop in the subcutaneous tissue to store any excess fat. Although apronectomy may bring temporary relief to very obese patients, the blood and nerve supply to the skin adjacent to the scar is always precarious, and the long-term results are seldom satisfactory.

Surgery to cause malabsorption

The original operations were designed to remove the great majority of the digestive and absorptive capacity of the small bowel, with the humane intention that the obese person would then be able to eat normally but not absorb the energy from the food. Several versions of jejunioleal bypass were designed, most of which left only about 45 cm of small bowel in continuity, with the remainder as a blind loop. Dietary fat was only briefly exposed to the action of bile and lipases, so it was incompletely digested and absorbed, with consequent weight loss. However there were penalties also: if fat is not absorbed, nor are fat-soluble vitamins. If free fatty acids are present in the bowel in high concentration they form insoluble compounds with calcium, and if calcium is bound in soaps the oxalate which is normally bound to calcium is absorbed. Thus

there were many unforeseen and unwanted effects on metabolism. Finally, it was shown that the weight loss observed after jejunioleal bypass was not primarily due to the decreased absorption of nutrients, but due to the fact that patients learned to restrict their food intake in order to control the diarrhoea which would otherwise ensue.⁹ The consensus among surgeons now is that the follow-up needed after jejunioleal bypass is an intolerable burden on both patient and surgeon, so these operations are being supplanted by the next category of operations.¹⁰

Operations to restrict food intake

If surgery forced patients to diet to avoid diarrhoea, but at the cost of long-term metabolic complications, it was obviously desirable that an operation should be devised which restricted food intake, but did not interfere with the normal digestion and absorption of food which had been ingested. The first such operation was a gastropasty, in which a fundal pouch was formed which emptied slowly into the main body of the stomach through a small stoma. The technique of these operations has been simplified by the introduction of stapling devices with which it is possible to partition the stomach without incising the stomach wall. The most popular version at present is the vertical banded gastropasty,¹¹ in which a fundal pouch with a capacity of only about 50 ml is formed which empties through a reinforced stoma near the lesser curvature of the stomach. Once the upper pouch is full any further intake of food results in reflux into the oesophagus, so the patient is forced to wait until the pouch empties before taking more food. By adjusting the size of the pouch and the size of the stoma the surgeon seeks to regulate food intake to a level at which normal weight will be achieved and maintained.

Obstruction to food intake can be achieved without abdominal surgery, notably either by wiring the jaws together,¹² or by inserting a balloon in the stomach as an artificial bezoar.¹³ Neither technique is satisfactory on its own, since when the wires are removed weight regain is almost inevitable, and weight gain may occur even when the balloon is still in place.¹³ Even with gastropasty operations the general experience is that weight loss is maximal about 18 months after the operation, and then there is a tendency to weight regain.^{14,15} This is to be expected: the patient will learn what foods are better tolerated and with experience will develop strategies by which energy intake can be increased. The only procedure which can be guaranteed to prevent weight regain (so long as it is tolerated by the patient) is a nylon waist cord, which becomes uncomfortably tight if much weight is regained.⁸

When is surgery the best option?

It is evident from the discussion above that surgery is only to be considered if a patient is unable to keep to a reducing diet, since surgical operations simply enforce dieting. It is important that this fact is explained to the patient. Many obese people conclude from what they read in magazines that somehow surgery causes massive weight loss without the need to diet, but of course that is not so. Even more mischievous is the idea that some obese people have a metabolic abnormality such that, although they keep to a diet supplying 800 kcal day, they do not lose weight. Despite intensive research I have not been able to document this phenomenon,⁸ and, if it did occur, then the patient thus afflicted would not lose weight with surgery either.

In practice the difficulty is to say when an obese patient is 'unable' to keep to a diet. Virtually every severely obese patient finds it difficult to diet, otherwise they would not be severely obese. Virtually every severely obese patient finds it quite easy (if not actually pleasant) to keep to a strict reducing diet if it is well prepared and served in a well-run metabolic ward. What defeats them (as it would defeat most of us) is the attempt to eat substantially less than the amount required to meet energy requirements, over a very long period, when ample palatable food is available. One way to tip the balance in favour of reducing intake is to place surgical obstacles in the way of normal food intake: to staple the stomach so a large meal causes discomfort and vomiting, or to wire the jaws together so it is possible to drink but not to chew food. This is not necessarily the best solution: if these obstructions are all that prevents the patient from satisfying his energy needs then he may resort to a large alcohol intake as an alternative strategy, which would be nutritionally unfortunate.

My own policy with severely obese patients who come seeking surgical treatment is to proceed in stages. Why have previous attempts to diet failed? Often the patient has had absurdly optimistic expectations about the rate of weight loss which should be achieved, and so has been disappointed: a rational explanation about the energetics of losing adipose tissue usually helps the patient to a more realistic approach and willingness to try dieting again. Often the problem has not been achieving weight loss, but maintaining weight loss: in such a case a waist cord fitted after weight loss is more appropriate than a surgical operation. Sometimes the problem is believed to be a metabolic resistance to weight loss: here whole-body calorimetry is helpful to establish the true energy requirements, and, as noted above, surgery would not be the solution anyway.

There remains the patient who does his best, but simply cannot diet, or at least not for more than a week

or two. He is tired of trying to diet, and feels that an operation would lift the burden of decision from him. The operation with the lowest mortality and morbidity is jaw wiring, and patients who have their jaws wired are advised to use milk as a sole energy source,⁸ with iron and vitamin supplements. I suggest that the patient tries for 4 weeks to keep to milk only: if it proves absolutely intolerable it will be wise to find out before committing himself to jaw wiring. About half the patients to whom this suggestion is made find that milk is not as bad as they had expected, and they continue on this diet without jaw wiring, but others opt to have their jaws wired. This is done on the understanding that a waist cord will be fitted after satisfactory weight loss – usually after 9 months or so. However jaw wiring is unacceptable to some, and technically impossible in edentulous patients, so these become candidates for a gastroplasty procedure.

Surgery in obese psychiatric patients

Treatment of severe obesity in patients with psychiatric disorders presents great difficulty. Dieting requires discipline and self-control, which such patients often lack, and their natural endowment of these qualities may be further reduced by medication. It is therefore tempting to seek a treatment which eliminates reliance on the will-power of the patient, such as surgery. Most surgeons are understandably unwilling to operate on patients with severe personality disorders, since they know that long-term follow-up will present endless problems. This reluctance is justified, because it requires more skill to select a nutritionally adequate diet if your jaws are wired, or your stomach is stapled, than it does for a normal person. But if not surgery, what is the alternative?

The alternative depends on the severity of the obesity, the severity of the mental disturbance, and the resources available to help the patient with the other problems of living. In some cases I think it is ethically unjustifiable to try to do anything about the obesity if the mental disorder is so severe that weight loss would bring no significant improvement in the quality of life. In some cases sympathetic support of the relatives, and some guidance about dietary principles, is appropriate even if no great effect on the obesity is foreseen. There is a spectrum of cases, ranging from the psychiatrically hopeless patient to the relatively normal 'compulsive eater': the point on this spectrum at which treatment is attempted will depend on the interest and patience of the physician.

Summary

A typical severely obese patient will have about 50 kg excess weight to lose, which is equivalent to a store of 350,000 kcal. The optimum rate of weight loss in such

a patient is about 1 kg/week, which involves an energy deficit of 1000 kcal/day for about a year. It is difficult to maintain this degree of dietary restriction over such a long period, and procedures such as jaw wiring or stomach stapling may help in some cases. Maintenance of weight loss is difficult to achieve and may be helped by fitting a nylon waist cord after

weight loss. On theoretical grounds, patients who do not lose weight despite keeping to a properly-designed reducing diet would not benefit from surgery, but in practice this problem does not arise. It is dangerous to resort to surgery for the treatment of severely obese patients who cannot diet by reason of psychiatric disorder.

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