

# Impact of Advanced Age on Weight Loss and Health Benefits After Laparoscopic Gastric Bypass

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**Background:** Advanced age is considered a relative contraindication to primary bariatric surgery at some institutions. As life expectancy is steadily increasing and quality of life is improving in our elderly population, we may need to reconsider the health benefits that obese elderly patients can obtain from bariatric surgery. Therefore, we examine the operative outcomes, weight loss, reduction of comorbidities, and medication requirements in patients older than 60 years compared with those younger than 60 years undergoing laparoscopic Roux-en-Y gastric bypass.

**Hypothesis:** The null hypothesis tested in this study is that patients older than 60 years who undergo laparoscopic Roux-en-Y gastric bypass experience a medical benefit not significantly different from that experienced by younger patients in terms of the number of medications and comorbid conditions.

**Methods:** The number of preoperative and postoperative comorbid conditions and the medications required for those conditions were compared between consecutive patients older than 60 years and those younger than 60 years who underwent Roux-en-Y laparoscopic gastric bypass. Early operative outcomes were also assessed.

**Results:** Analysis of 110 patients younger than 60 years compared with 20 patients older than 60 years revealed no difference in complication rate or length of hospital stay. Younger patients lost more weight and had a significantly greater reduction in body mass index. Younger patients also demonstrated more complete resolution of comorbid conditions, although this difference was not significant. Older patients, who had more comorbid conditions requiring more medication at the time of surgery, experienced a greater medication reduction during follow-up, although this was not statistically significant.

**Conclusions:** Patients of advanced age can safely undergo laparoscopic Roux-en-Y gastric bypass. Younger patients can be expected to demonstrate greater weight loss and experience more complete resolution of their comorbid conditions. Older patients demonstrated greater overall reduction in medication requirements. Therefore, patients older than 60 years can be considered good candidates for obesity surgery and can be expected to enjoy substantial health benefits similar to those experienced by younger patients.

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**D**ATA DESCRIBING THE OBESITY epidemic in the United States are alarming by the total numbers as well as the rapidly rising rates. In 1991, an estimated 12% of the US population had a body mass index (calculated as weight in kilograms divided by height in meters squared) of at least 30 kg/m<sup>2</sup>, a number that changed to approximately 20% a decade later.<sup>1</sup> The current socioeconomic burden of this epidemic includes 300 000 annual deaths and a total cost of over \$100 billion yearly, making the total impact similar to that from poverty, smoking, or alcohol abuse.<sup>2</sup> However, for these other social problems, no reasonable surgical alternatives exist.

The development of safer and less invasive bariatric surgical procedures, which clearly provide superior long-term cure rates for obesity compared with conservative measures, has created a palpable surge in public interest in undergoing such

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procedures.<sup>3-7</sup> Some centers consider advanced age a relative contraindication to these procedures. This notion is based on the assumption that the risk outweighs the long-term benefit to be realized by patients with fewer expected remaining years. However, not only is life expectancy

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steadily increasing, so too is the quality of health and life of the advanced-aged cohort.<sup>8</sup> Therefore, we may need to reconsider the health benefits that obese elderly can achieve from the current restrictive procedures, which are being offered with continually less surgical morbidity. In this study, we examine the relative impact of laparoscopic gastric bypass on weight loss, comorbidities, and medication requirements in patients older than 60 years compared with those younger than 60 years.

## METHODS

### PATIENTS

The collective series of consecutive patients who underwent laparoscopic gastric bypass by a single surgeon at our institution was considered for evaluation. Patients undergoing reoperative bariatric surgery were not considered for analysis.

### STUDY DESIGN

Early operative outcomes and current results as assessed at the most recent follow-up were compared between patients older than 60 years and those younger than 60 years. The purpose of the study was to evaluate the effect of advanced age on the ability to lose weight, improve from comorbid conditions, and decrease medication requirements to treat those conditions. In addition, early operative morbidity and outcomes were compared between the 2 groups.

### DATA COLLECTION

A prospectively collected database was utilized to review patient course and outcome. Parameters recorded for hospital course included mortality, morbidity, and number of hospital days. Specific morbidities analyzed were wound infection, urinary tract infection, pneumonia, abscess, deep venous thrombosis, pulmonary emboli, atrial fibrillation, congestive heart failure, myocardial infarction, anastomotic leak, and gastrointestinal perforation.

Patient parameters used to evaluate outcome included weight, body mass index, number of comorbidities, number of medications to treat those comorbidities, and the need for breathing-support devices at night. Each of these parameters was recorded at the time of operation and the most recent follow-up. At the time of data analysis, patients were contacted to establish current medications and the need for sleep-assist devices. The 7 specific comorbidities analyzed were hypertension, adult-onset diabetes, symptomatic gastroesophageal reflux disease, hyperlipidemia, depression, sleep apnea, and osteoarthritis. The presence of each condition was defined as being documented in a physician consultation note. Prospective diagnostic testing was not performed on every patient. Each of these variables was recorded as present or absent before and after surgery. The number of medications used to treat these specific conditions was recorded before and after surgery with the exception of medications for arthritis pain, as all patients are required to stop taking nonsteroidal anti-inflammatory medication after surgery per protocol.

### DATA ANALYSIS

Comparisons between patients younger than 60 years and those older than 60 years were analyzed using the *t* test to assess the statistical significance of the differences. The variance of difference was characterized with 95% confidence intervals generated around the difference between group means. The vari-

ance of follow-up was analyzed between groups, and since follow-up time is not normally distributed, the log-rank test was used to assess statistical significance.

## RESULTS

### PATIENTS

In the consecutive series, 110 patients younger than 60 years underwent laparoscopic Roux-en-Y gastric bypass between November 2001 and July 2003. In this group, the mean age was 45.0 years (range, 19-59 years). These patients were compared with 20 patients older than 60 years who underwent the same operation. In the older group, the mean age was 65.2 years (range, 60-73 years).

### AT OPERATION

At operation, the mean weight in the older group was 305.2 lb (range, 218.0-407.9 lb) compared with 301.6 lb (range, 207.0-509.7 lb) in the younger group. This corresponded to a mean body mass index of 46.4 kg/m<sup>2</sup> (range, 37.3-56.4 kg/m<sup>2</sup>) in the older group and 48.2 kg/m<sup>2</sup> (range, 37.6-85.0 kg/m<sup>2</sup>) in the younger group. The mean number of comorbid conditions out of a possible 7 was 4.6 (range, 2-6) in the older patients and 3.7 (range, 0-7) in the younger patients. The mean number of medications for these conditions was 4.9 (range, 1-10) in the older group and 2.7 (range, 0-7) in the younger group. The percentage of patients requiring sleep-assist devices for sleep apnea was similar in the 2 groups, with 50% in the older group and 41% in the younger group.

### OPERATIVE OUTCOME

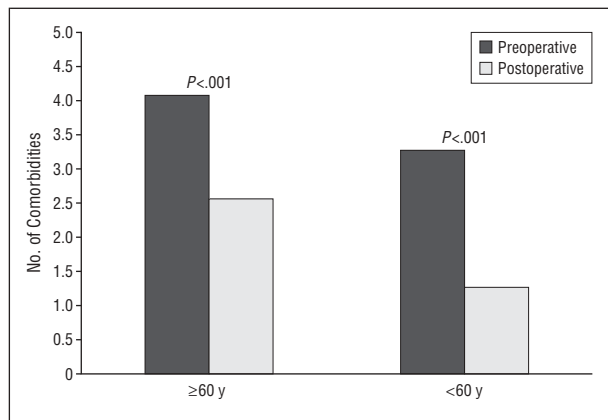
The mean hospital stay was 2.9 days (range, 2-10 days) in those older than 60 years compared with 2.6 days (range, 2-10 days) in those younger than 60 years (*P* = .39). Complications were documented in 10% of the older cohort and 8% of the younger cohort. The 2 complications in the older cohort included 1 wound infection treated with oral antibiotics and 1 leak from the stapled gastric remnant treated conservatively with a short period of bowel rest until there was no radiographic evidence of a leak. The cumulative percentage of complications in the younger cohort was approximately 8.2%. These consisted of 1 case of deep venous thrombosis, 1 exacerbation of congestive heart failure, 3 cases of pneumonia, 3 cases of urinary tract infection, and 1 jejunal perforation. In the patient with perforation, routine swallow test results obtained on postoperative day 1 revealed extravasation of contrast from the Roux limb of jejunum near but not at the anastomosis. The patient was explored, and the hole was repaired primarily; the patient was discharged on hospital day 10.

### FOLLOW-UP

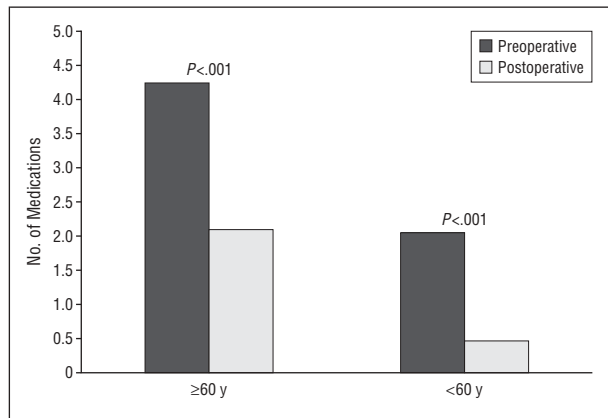
The mean  $\pm$  SD follow-up was 9.7  $\pm$  4.3 months (range, 3-17 months) in the older group and 10.2  $\pm$  5.1 months (range, 3-20 months) in the younger group. Analysis of variance found the distribution of follow-up times to be similar (*P* = .16). During this time, the mean weight loss

was greater in the younger patients, although this difference was not significant. However, this weight loss translated into a reduction in body mass index, which was significantly greater in the younger patients ( $P = .03$ ).

The older patients had more comorbidities at operation with 4.6, compared with 3.7 in the younger group. At follow-up, the older and younger patients were found to have an average of 2.9 and 1.4 comorbidities, respectively (**Figure 1**). The difference was significant for both groups ( $P < .001$ ). Comparing the 2 groups, an average reduction of 1.7 comorbid conditions in older patients was less than that observed in the younger patients, who



**Figure 1.** A graph comparing the number of comorbid conditions of obesity at operation and at the most recent follow-up between the 2 groups.



**Figure 2.** A graph comparing the number of medications required for the treatment of comorbid conditions of obesity at operation and at the most recent follow-up between the 2 groups.

lost an average of 2.3 conditions. However, this difference was not significant ( $P = .12$ ). The number of medications required for the comorbid conditions also demonstrated a significant reduction in both groups ( $P < .001$ ) (**Figure 2**). The mean number of medications in the older group at operation was 4.85, which was reduced to 2.7 at the most recent follow-up. This compared with a mean medication requirement in the younger group at operation of 2.7, reduced to 1.1 at the most recent follow-up. The decrease was significant in both groups ( $P < .001$ ) (Figure 2). The older patients therefore were able to decrease their medication burden to a greater extent than the younger patients, although this difference was not significant ( $P = .19$ ). The statistical results of compared parameters between the 2 groups are outlined in the **Table**.

The percentage of patients who no longer used sleep-assist devices at night at the most recent follow-up was slightly greater in the younger group. The percentage of patients in the older group still using the devices at follow-up was 25% of the population, equal to one half the original amount. This compared with 14% of the younger patients, representing approximately one third of the 41% of patients requiring the devices at surgery.

#### COMMENT

Early in the course of performing gastric bypass for morbid obesity, the National Institutes of Health Consensus Conference on Health Implications of Obesity in 1985 recognized age older than 50 years as a potential contraindication for bariatric surgery.<sup>9</sup> This was based on earlier data that brought the overall benefit of such operations into question because of the higher published complication rates and the poorer results.<sup>10</sup> However, within the past decade, data have emerged demonstrating that patients older than 50 years can be considered safe candidates for Roux-en-Y gastric bypass, with long-term results more comparable to those of younger patients than had previously been established.<sup>11,12</sup> Only 1 institution has published data addressing the issue of age with the advent of laparoscopy for Roux-en-Y gastric bypass. In this study, comparisons were drawn between the laparoscopic and open approaches in patients older than 50 years without a younger group for comparison.<sup>13</sup> Results from their comparison suggested that laparoscopy produces

**Table. Statistical Comparison Between Groups**

Variable	Group		Difference		
	≥60 y, Mean ± SD	<60 y, Mean ± SD	Mean ± SD	95% Confidence Interval	P Value
Weight at operation, lb	305.2 ± 59.20	301.6 ± 65.55	3.63 ± 64.65	-27.5 to 34.73	.82
Body mass index* at operation	46.35 ± 5.33	48.22 ± 8.32	-1.87 ± 7.94	-5.69 to 1.95	.34
Weight loss, lb	86.35 ± 40.22	96.96 ± 35.42	-10.6 ± 36.17	-28.0 to 6.79	.23
Body mass index* reduction	12.61 ± 4.90	15.53 ± 5.35	-2.92 ± 5.28	-5.46 to -0.38	.03
Comorbidity reduction	1.70 ± 1.66	2.29 ± 1.53	-0.59 ± 1.55	-1.34 to 0.16	.12
Medication reduction	2.15 ± 1.90	1.62 ± 1.63	0.53 ± 1.67	-0.27 to 1.33	.19

\*Calculated as weight in kilograms divided by height in meters squared.

less adverse events in these patients. This study also concluded that Roux-en-Y gastric bypass is safe and well tolerated with satisfactory long-term results in terms of weight loss and reduction of medical comorbidities, although no comparison was made to address how these results compared with those of a younger cohort.

Our study specifically addresses an even older cohort than has previously been discussed in the literature. This study represents the first investigation of a true geriatric population undergoing Roux-en-Y laparoscopic gastric bypass. Further, the direct comparison with younger patients helps us delineate the impact of advanced age on the expected effects of this operation. The more favorable weight loss in younger patients seen in this study has been previously reported<sup>14,15</sup>; however, those studies stratified patients around a much younger age, with younger overall study populations. Sensibly, we may assume that younger patients may naturally have better exercise tolerance and more active lifestyles, although no published data exist on this topic. Older patients have been found to possess a decreased ability to liberate fatty acids from adipocytes and oxidize fat for fuel by respiring tissues.<sup>16</sup> Lipolytic capacity after sympathetic stimulation has also been shown to be attenuated with age.<sup>17</sup> Interestingly, although perhaps less simple to explain, younger patients have been demonstrated to have a greater reduction of energy intake after Roux-en-Y gastric bypass.<sup>14</sup>

The safety of this operation in older patients has been previously reported to be dramatically improved by the laparoscopic approach.<sup>13</sup> In this study, older patients experienced no greater complication rate after surgery. With only 20 patients in the older group, this study lacks the power to detect small differences, making it susceptible to a type II error regarding short-term outcome. However, the power of the study does at least suggest that the operation is quite safe in this age group.

The older patients in our study population appear to experience less complete resolution of their comorbidities, which is also a rational finding as older patients have a higher rate of background comorbidities independent of obesity, and these patients have usually been affected by their comorbid conditions for decades. However, the older patients also have more comorbid conditions and medication requirements (Figures 1 and 2). The trend toward a greater reduction in medication requirements in the older patients suggests that these patients derive a great benefit from the operation as their comorbid conditions appear to substantially improve, albeit without complete resolution to the degree experienced by younger patients. Similarly, the older population saw a dramatic reduction in the number of patients requiring sleep-assist devices at the most recent follow-up, although not quite as much as the younger patients. A significant reduction in hypertension, hyperglycemia, degenerative joint disease, gastroesophageal reflux disease, and dependence on sleep-assist devices has been previously documented in patients older than 50 years after gastric bypass.<sup>13</sup> These results are confirmed by our data, wherein analysis of the results at follow-up in the older patients

demonstrated that the reduction in comorbidities and medications was clearly significant ( $P < .001$ ).

Combining the expected medical improvement with the fact that the short-term complication rate in the older patients is not substantially worse after laparoscopic bypass than in the younger patients, we believe that patients older than 60 years should be considered for laparoscopic Roux-en-Y gastric bypass if they have no major life-limiting processes and meet the standard criteria for the operation.

Patients of advanced age can safely undergo Roux-en-Y gastric bypass with operative results nearly identical to those of younger patients. Younger patients can be expected to demonstrate greater weight loss. Similarly, younger patients can be expected to experience more resolution of their comorbid conditions. However, the older patients still demonstrate considerable improvement of their comorbidities, as evidenced by the greater overall reduction in medications seen at follow-up. Therefore, patients older than 60 years can be considered good candidates for obesity surgery, and whether the health benefits they realize after surgery translate into a long-term survival benefit or overall health cost savings will be determined by longer follow-up.

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