Quality of Life after Lap-Band Placement: Influence of Time, Weight Loss, and Comorbidities

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Abstract

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Objective: To assess the quality of life (QOL) in severely obese subjects before and after Lap-Band gastric restrictive surgery and identify factors that may influence change.

Research Methods and Procedures: All patients, over a 3-year period, attending for preoperative assessment (n = 459) or annual review after surgery (n = 641) have completed the Short Form-36 (SF-36) health survey. Eight domain and physical component summary (PCS) and mental component summary (MCS) scores were calculated. Scores were analyzed in groups based on time after surgery and compared with community normal (CN) values. Paired preoperative and 1-year scores (n = 218) data were used to find predictors of QOL change.

Results: All preoperative mean scores (n = 459) were lower than CN values, with greater impairment in the PCS (36.8 ± 9.5 vs. CN: 51.3 ± 8.3, $p < 0.001$) than in the MCS (45.7 ± 8.2 vs. CN: 48.8 ± 9.5, $p < 0.001$) scores. After 1 year, scores were closer to CN scores (PCS: 52.4 ± 8.2 and MCS: 48.4 ± 7.7), and these remained closer for 4 years. Preoperative obesity comorbidity, especially physical disability, was the best predictor of poor preoperative SF-36 scores and of improvement in scores at 1 year. The percentage of excess weight loss at 1 year (46 ± 16%) was of little predictive value of improved QOL.

Discussion: Severely obese subjects have poor health-related QOL as measured by the SF-36 health survey. Lap-Band surgery for this group has provided a dramatic and sustained improvement in all measures of the SF-36. Improvement is greater in those with greater preoperative disability, and the extent of weight loss is not a good predictor of improved QOL.

Key words: Short Form-36 health survey, arthritis, depression, surgery, metabolic

Introduction

Severe obesity has a major impact on the physical, mental, psychosocial, and economic health of patients. The prevalence of obesity is increasing to the extent that the World Health Organization has described an epidemic of obesity affecting most developed and developing countries (1).

With recent advances in obesity surgery, there are now safe, effective, minimally invasive methods of achieving and sustaining significant weight loss (2,3). The outcome from obesity surgery should not be measured by weight loss alone. Broader outcome measures are important, and the impact of surgery on the patients' medical comorbidity and physical and psychosocial health needs to be assessed. From the perspective of patients, quality of life (QOL) is arguably the most important outcome measure from a weight-reducing procedure.

There are a number of health-related instruments for measuring QOL. Although some are specifically designed for obese subjects (4,5), there are advantages in using a widely applied and validated instrument because population norms can be obtained, the relative burden of different conditions can be evaluated, and outcomes of clinical practice can be assessed in comparison with the pretreatment condition and the general community. The Medical Outcome Study Short Form-36 (SF-36) health survey provides a suitable instrument (6,7). Population norms are well-established. Subjects with a broad range of medical conditions have been surveyed, and it is an instrument that has been used to study QOL changes with increasing body mass index (BMI) (8,9). It has also been used in a limited way in

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assessing the outcomes of bariatric surgery (10–12). This instrument has been used and validated in Australia and was included in the Australian Bureau of Statistics 1995 National Health Survey (13), and limited population norms have been published (13,14).

Our group has been using the Lap-Band system, an adjustable laparoscopically placed gastric band, as the primary surgical method of achieving weight loss since 1994. Since January 1998, all patients presenting for surgery or attending for annual review have completed the SF-36 health survey questionnaire. We report the results of the analysis of the questionnaires completed over this 3-year period, with emphasis on identifying the relationships between change in QOL and the change in weight, comorbidity, and physical capacity.

Research Methods and Procedures

Patients with a BMI $>$ 35 kg/m^2, suffering significant medical, physical, or psychosocial disabilities and who had attempted weight reduction by other means for at least 5 years, were considered for surgery. Preoperative assessment included medical assessment, documentation of comorbidity, biochemical tests, and completion of standardized questionnaires, including the SF-36 health survey. Informed written consent was obtained from all patients before surgery. The study has been carried out in accordance with the Declaration of Helsinki.

Study Design

The SF-36 health survey (modified Australian version) (15) has been completed preoperatively and at yearly follow-up by all patients seen between January 1998 and January 2001.

The health survey was scored in a standard manner into 8 multi-item scaled scores, or domains (16). The domain scaled scores (0 to 100) are physical function, physical role, pain, general health, vitality, social functioning, emotional role, and mental health. The scores from the eight domains were individually weighted into physical and mental components, and then combined to calculate the SF-36 physical component summary (PCS) and mental component summary (MCS) health scales (6). These two health summary scales were adjusted to achieve a community mean value of 50 with an SD of 10.

Population normal scores were obtained from tables giving mean values (SD) for the eight domains and two summary scales for subjects based on age and sex (6,7). Although these are based on U.S. data, scoring has been shown to be generally comparable with reported Australian studies (13,14).

In 459 consecutive patients, a set number of preoperative variables were examined for their effect on preoperative SF-36 domain and summary scores. In addition, the effect of these variables and weight loss, as measured by the percentage of excess weight loss at 1 year, were examined for their influence on the change in SF-36 domain and summary scores in the first year (n = 218 paired). We examined for correlation between general variables and the SF-36 scores. These general variables included BMI, waist-to-hip ratio, age, sex, smoking status, alcohol consumption, insulin sensitivity, and weight history. Insulin sensitivity was measured using the homeostatic model assessment (17) and the percentage of insulin sensitivity calculated from fasting plasma glucose and C-peptide concentrations preoperatively. Weight history was a personal assessment of the stage in the patients' life that a weight problem was first recognized. The weight history was scored using the following ordinal categories: 1) from birth, 2) before start of school, 5 to 6 years old, 3) before secondary school, 11 to 13 years old, 4) before completing secondary school, 17 to 19 years old, 5) before completing education or 23 to 24 years old, 6) before marriage if applicable, and 7) later onset of a weight problem. Several specific comorbidity variables were also assessed as being present or absent, including arthritis/joint pain (with subanalysis of those with only lower limb symptoms compared with those with only back pain), depression, anxiety, diabetes, hypertension, asthma, gastroesophageal reflux, and the Epworth Sleepiness Scale score (18) as a measure of daytime sleepiness. Variables were chosen to avoid comparison with similar variables, e.g., BMI and weight and sleep apnea and daytime sleepiness. Assessment of history and comorbidity was made and recorded during the preoperative period.

Statistical Analysis

Three groups of data were analyzed. Data from the 459 consecutive patients preoperatively: linear regression analysis was used, using forward and backward modeling to find independent preoperative factors or conditions that favorably or unfavorably affected preoperative SF-36 scores. β-coefficients and combined r^2 were reported. For domains physical role and emotional role, where responses are not normally distributed, ordinal regression was used and Cox and Snell pseudo-r^2 was reported. All scores obtained preoperatively and at yearly follow-up were reported with grouped mean $\pm$ SD. ANOVA with the Tukey post hoc method was used to assess the significance of difference between responses to the SF-36 preoperatively and at yearly intervals to 4 years. Of the patients, 218 had completed paired preoperative and 1-year surveys. Linear regression analysis with forward and backward modeling was used to examine for independent factors influencing the change in SF-36 scores at 1 year. β-coefficients and combined r^2 have been reported. To test for any nonlinear effect of the percentage of excess weight loss at 1 year on SF-36 scores, the group was divided into quartiles and mean scores were

Table 1. SF-36 scores preoperatively and at yearly follow-up after Lap-Band surgery

	Before surgery	1-Year	2-Year	3-Year	≥4 Years	*p* Value	Community norm*
Number	459	320	172	80	69		
Weight (kg)	127 ± 26†	98 ± 21‡§	94 ± 21‡¶	94 ± 21‡¶	92 ± 20‡¶	<0.001	
BMI (kg/m^2)	45.0 ± 8†	35.1 ± 6‡§	33.6 ± 6‡¶	33.5 ± 6‡¶	32.9 ± 6‡¶	<0.001	
Percentage of excess weight loss	—	46 ± 16†	52 ± 19‡	50 ± 22‡	51 ± 23‡	<0.001	
Physical function	46.3 ± 23†	83.7 ± 18‡	83.4 ± 21‡	79.8 ± 23‡	77.5 ± 24‡	<0.001	88 ± 17
Physical role**	41.4 ± 39†	86.4 ± 29‡§	85.6 ± 31‡	80.00 ± 36‡	73.0 ± 37‡¶	<0.001	83 ± 32
Pain	62.8 ± 23†	84.4 ± 20‡§	83.0 ± 21‡	79.6 ± 24‡	75.4 ± 25‡¶	<0.001	75 ± 23
General health	42.6 ± 21†	76.5 ± 19‡	75.7 ± 18‡	73.3 ± 21‡	71.8 ± 22‡	<0.001	74 ± 19
Vitality	33.4 ± 21†	64.2 ± 20‡§	63.7 ± 21‡§	62.0 ± 21‡	54.4 ± 22‡¶	<0.001	59 ± 19
Social function	54.1 ± 28†	82.6 ± 24‡	83.3 ± 25‡	81.6 ± 25‡	76.0 ± 24‡	<0.001	83 ± 23
Emotional role**	52.3 ± 42†	81.3 ± 35‡	78.7 ± 37‡	79.6 ± 36‡	70.5 ± 39‡	<0.001	81 ± 34
Mental health	58.8 ± 21†	73.2 ± 18‡	72.7 ± 20‡	72.8 ± 19‡	67.0 ± 19‡	<0.001	73 ± 17
Physical component summary	36.8 ± 9.5†	52.4 ± 8.2‡	52.1 ± 8.2‡	50.1 ± 10.6‡	49.2 ± 10.6‡	<0.001	51.3 ± 8.3
Mental component summary	45.7 ± 8.2†	48.4 ± 7.7‡	48.4 ± 7.6‡	49.0 ± 7.9‡	48.1 ± 7.5‡	<0.001	48.8 ± 9.5

Mean ± SD; *p* values calculated using ANOVA with post hoc analysis Tukey.
* Community norms (mean ± SD) from tables matched for age and sex.8,9
†,‡ Differences between scores marked † and ‡ were significant (ANOVA).
§,¶ Differences between those marked § and ¶ were also significant (ANOVA).
** Responses to physical role and emotional role were not normally distributed, Kruskal–Wallis nonparametric test used.

analyzed using ANOVA with post-hoc Tukey method. Community norm (CN) values are expressed as age- and sex-matched mean ± SD. CN mean values are used in Figures 3 and 4 for visual comparison with preoperative values and follow-up scoring. Figures 3 and 4 are displayed in a standard way with physical domains to the left and mental domains to the right.

Results

The SF-36 was completed by 459 consecutive patients before Lap-Band surgery. There were 71 men and 398 women. Their mean age at the time of surgery was 41 ± 9.8 years. The weight characteristics of this group and those who have completed subsequent annual surveys are shown in Table 1.

Table 1 shows the mean (± SD) scores for the eight domains and the two component summary scores for all patients who completed the survey preoperatively and at annual review to 4 years. The SF-36 scoring for the 218 patients who completed paired preoperative and 1-year surveys or the 70 patients who completed preoperative, 1-year and 2-year surveys were not different from the whole group completing surveys preoperatively and at these particular follow-up times. In view of this, we believe that results in years 3 and 4 will reliably reflect scores at these periods. Completed questionnaires have been received from 84% of all patients at respective annual reviews.

These severely obese subjects have markedly lower scores preoperatively than the CN values for all eight domain scores (Table 1), and all have lower scores than those found by McCallum (13) for Australians with serious medical conditions. All mean scores improved significantly after surgery and remained significantly higher than preoperative scores and closer to CN values to 4 years (Table 1). However, the domains of vitality, pain, and physical role showed a significant fall in mean score between the 1-year and 4-year follow-ups. It is noteworthy that in these domains mean values at 1 year were significantly higher (unpaired Student's *t* test, $p < 0.05$ for all) than were community levels. There were no significant differences in the responses of subjects surveyed at 2, 3, or 4 years after Lap-Band placement (Table 1).

A question included in the SF-36 but not included in the scaled or summary scores relates the patients' perception of

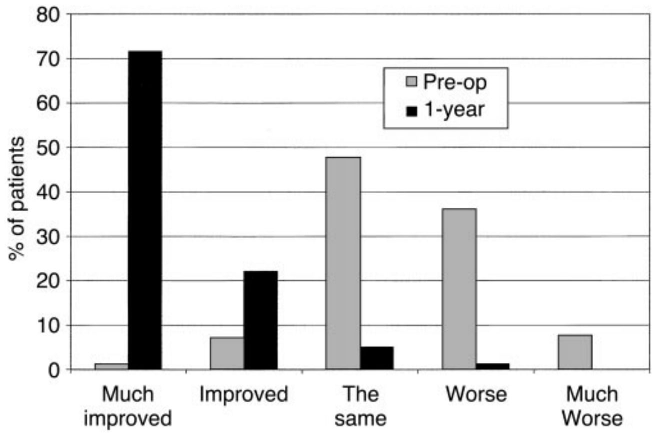

Figure 1: Patients' opinions as to the change in their health in the last year. Preoperative patients (n = 459) and 1-year follow-up (n = 320).

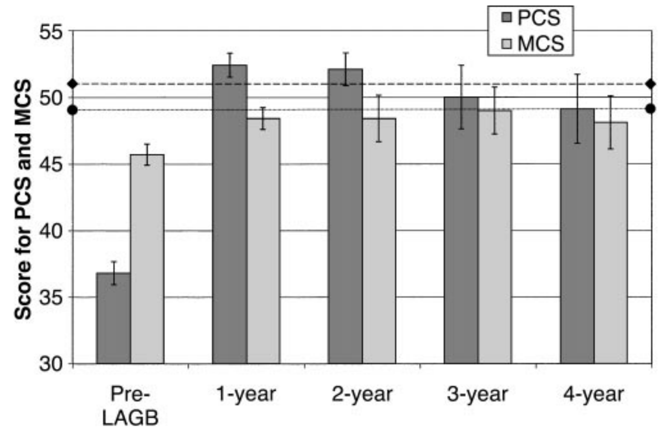

Figure 2: Mean and 95% confidence interval of mean for physical and mental component summary scores before Lap-Band surgery and at yearly follow-up. CN scores are PCS, 51.3 (dashed line) and MCS, 48.8 (dotted line) age- and sex-matched (6).

change in health in the last 12 months. There was a marked improvement in perceived health as shown in Figure 1.

Influences on PCS

Using linear regression analysis, several factors were independently associated with a low PCS score preoperatively in the 459 consecutive patients. These include a history of arthritis or joint pain ($n = 347$, $r = -0.26$, $p <$ 001), higher preoperative BMI ($r = -0.24$, $p < 0.001$), age ($r = -0.15$, $p = 0.002$), depression ($n = 131$, $r = -0.123$, $p = 0.014$), and gastroesophageal reflux ($n = 243$, $r = -0.11$, $p = 0.019$). In addition, alcohol consumption ($n = 257$, $r = 0.13$, $p = 0.003$) was associated with a higher PCS score. These six factors had a combined r^2 of 0.21.

The mean PCS score improved markedly in the first year after surgery and scores remained within the normal range to at least 4 years (Figure 2). Linear regression analysis of the data for the 218 patients with paired preoperative and 1-year measures revealed three clinical predictors of a greater improvement in the PCS score. These were the weight loss (in kilograms) of the patient ($r = 0.16$, $p = 0.02$), a history of arthritis/joint pains, and a history of depression. Weight loss, as measured by the percentage of excess weight loss at 1 year, was not a predictor of improvement in the PCS score. Patients suffering from arthritis or joint pain ($n = 158$) reported a greater improvement in the PCS score of 17.3 $\pm$ 10 compared with 13.2 $\pm$ 8 ($p = 0.001$) for the remainder of patients. Patients with a history of depression ($n = 52$) also reported a greater improvement in PCS score 18.8 $\pm$ 11 compared with 14.8 $\pm$ 9 ($p = 0.009$). A history of arthritis/joint pain, a history of depression, and weight loss (in kilograms) were independently associated with greater improvement in PCS ($r^2 = 0.11$, $p < 0.001$).

Influences on MCS Score

Low MCS scores preoperatively were independently associated with four factors. These were a history of depression ($n = 131$, $r = -0.32$, $p < 0.001$), younger age ($r = +0.17$, $p = 0.012$), developing a weight problem at a later stage of life ($r = -0.17$, $p = 0.001$), and gastroesophageal reflux ($n = 243$, $r = -0.11$, $p = 0.031$). These four factors had a combined r^2 of 0.21. The patients' weight, waist-to-hip ratio, BMI, sex, and other factors had no preoperative predictive effect on MCS score.

The mean MCS score improved in the first year after surgery, and the score remained within the normal range to at least 4 years (Figure 2). Analysis of those with paired preoperative and 1-year data ($n = 218$) showed two factors that were associated with greater improvement in MCS score: younger age ($r = -0.27$, $p = 0.001$) and patients reporting arthritis or joint pain preoperatively ($r = 0.14$, $p = 0.040$). These factors had independent effects with a combined r^2 of 0.065 ($p = 0.001$). There was no correlation between change in MCS score and the amount of weight loss. Those with a history of depression had a lower preoperative MCS score preoperatively, and although their MCS score improved, it remained significantly less than the overall group with a score at follow-up of 43.7 $\pm$ 9 compared with 49.7 $\pm$ 6 ($p < 0.001$) for those without a history of depression.

Influences on Domain Scores

Independent factors associated with lower or higher preoperative ($n = 459$) SF-36 domain scores are shown in Table 2. Factors affecting preoperative scores are predominantly related to comorbidity, with BMI having a significant impact only on physical function and general health. Factors associated with the change in SF-36 domain scores at 1 year ($n = 218$ paired) are shown in Table 3. Again, comorbidity and age are the predominant influences.

Table 2. Influences on preoperative SF-36 eight domain responses for 459 consecutive severely obese preoperative patients: variables listed are independently significant

	Factor	Influence	β Coefficient	*p* Value
Physical function	BMI	−	−0.31	<0.001
	Arthritis and joint pain	−	−0.21	<0.001
	Male sex	−	−0.20	<0.001
	Epworth Sleepiness Scale	−	−0.19	<0.001
	Weight history	−	−0.17	=0.001
	Combined r^2		0.24	<0.001
Physical role	Arthritis and joint pain	−	0.06*	<0.001
	Depression	−	0.06*	<0.001
	Combined psudo-r^2		0.10*	<0.001
General health	Depression	−	−0.24	<0.001
	BMI	−	−0.14	0.006
	Arthritis and joint pain	−	−0.09	0.045
	Combined r^2		0.09	<0.001
Energy	Depression	−	−0.20	<0.001
	Arthritis and joint pain	−	−0.13	0.014
	Gastroesophageal reflux	−	−.13	0.014
	Alcohol consumption	+	0.11	0.035
	Combined r^2		0.094	<0.001
Pain	Arthritis and joint pain	−	0.36	<0.001
	Depression	−	0.18	0.002
	Combined r^2		0.17	<0.001
Social function	Gastroesophageal reflux	−	−0.18	0.013
	Age	+	+0.17	0.021
	Diabetes	+	+0.13	0.007
	Epworth Sleepiness Scale	−	−0.12	0.020
	Combined r^2		0.09	0.001
Emotional role	Depression	−	0.08*	<0.001
	Anxiety	−	0.03*	0.004
	Combined psudo-r^2		0.10*	<0.001
Mental health	Depression	−	−0.36	<0.001
	Age	+	+0.28	<0.001
	Weight history	−	−0.16	0.004
	Combined r^2		0.22	<0.001

Linear regression analysis: β coefficients of the independent factors influencing the degree of change in the domain scores of the SF-36.
* Responses to physical and emotional role were not normally distributed and have been assessed using ordinal logistic regression with Cox and Snell psudo-r^2 shown.

Effects of Change in the Percentage of Excess Weight Loss at 1 Year on QOL

For the 218 patients with paired data, significant influences in the change at 1 year in the eight domain scores of the SF-36, as indicated by linear regression analysis, are shown in Table 3. In particular, the extent of weight loss had very little effect. General health was the only domain to be influenced by the usual method of reporting weight loss after bariatric surgery—the percentage of excess weight loss at 1 year. Actual weight loss was a significant factor in improved general health and physical function. To assess for any nonlinear associations with the percentage of excess

Table 3. Factors associated with the change in SF-36 eight domain scores between the preoperative and 1-year surveys for 218 paired subjects: variables listed are independently significant

	Factor	Influence	β Coefficient	p Value
Physical function	Arthritis and joint pain	+	0.31	<0.001
	Weight loss	+	0.19	0.005
	Combined r^2		0.09	<0.001
Physical role	Arthritis and joint pain	+	0.17	0.010
	Depression	+	0.15	0.025
	Combined r^2		0.06	0.003
General health	Age	−	−0.22	0.001
	Depression	+	0.18	0.007
	Arthritis and joint pain	+	0.17	0.010
	Percentage of excess weight loss	+	0.15	0.019
	Combined r^2		0.14	<0.001
Energy	Arthritis and joint pain	+	0.21	0.002
	Asthma	+	0.17	0.009
	Combined r^2		0.09	<0.001
Pain	Arthritis and joint pain	+	0.27	<0.001
Social function	Anxiety	+	0.17	0.013
	Age	−	−0.16	0.021
	Diabetes	−	−0.13	0.047
	Combined r^2		0.08	0.001
Emotional role	Arthritis and joint pain	+	0.15	0.024
	Anxiety	+	0.14	0.030
	Combined r^2		0.05	0.009
Mental health	Arthritis and joint pain	+	0.21	0.002
	Age	−	−0.18	0.007
	Anxiety	+	0.2	0.003
	Combined r^2		0.11	<0.001

Linear regression analysis: β coefficients of the independent factors influencing the degree of change in the domain scores of the SF-36.

weight loss at 1 year, the group of 218 patients was divided into quartiles based on this measure. The median percentage of excess weight loss at 1 year for this group was 41.7%, with a 25th percentile of 32.8% and a 75th percentile of 51.4%. Using ANOVA, the scores of the eight domains and the two summary scores were examined. The only difference between groups that was significant was the difference in the mean rise of general health score between quartiles 1 and 2, with mean rises of 25.0 ± 20 and 35.3 ± 19, respectively ($p = 0.028$). There were no significant differences in the change of any of the SF-36 eight domain scores or component summary scores between the quartile with the lowest percentage of excess weight loss at 1 year, quartile 1, and that of the greatest, quartile 4. All patients lost weight, and 95% of patients lost >11.8 kg.

Response of Patients with Back Pain and Lower-Limb Pain

Patients are all assessed preoperatively for arthritis/joint pain that may be caused or aggravated by obesity. Of 218 with paired preoperative and 1-year SF-36 surveys completed, 118 (54%) suffered back pain, usually lower back, and 98 (45%) had pain in the lower limbs, most commonly, knee, ankle, and foot pain. A total of 158 patients (72%) reported regular pain or discomfort of an arthritis/joint nature. For seven of the eight domains of the SF-36, those patients suffering with arthritis/joint pain improved significantly more than the remainder of patients (Table 2). For all eight domains, those with arthritis/joint pain had lower scores than did nonsufferers preoperatively. At 1 year, only two mean domain scores remained lower: physical function

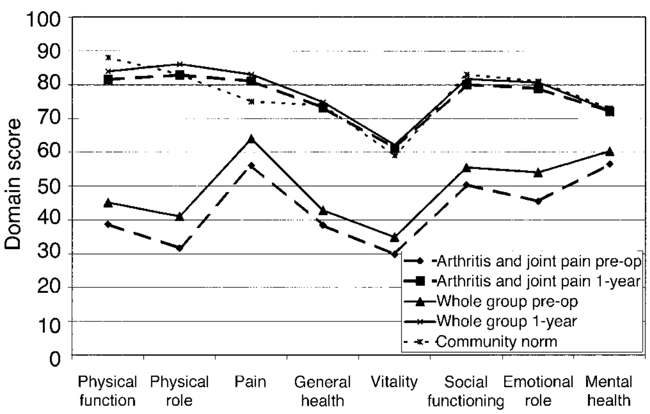

Figure 3: Patients with arthritis or joint pain ($n = 158$) compared with the whole group ($n = 218$) with paired pre-Lap-Band and 1-year completed surveys.

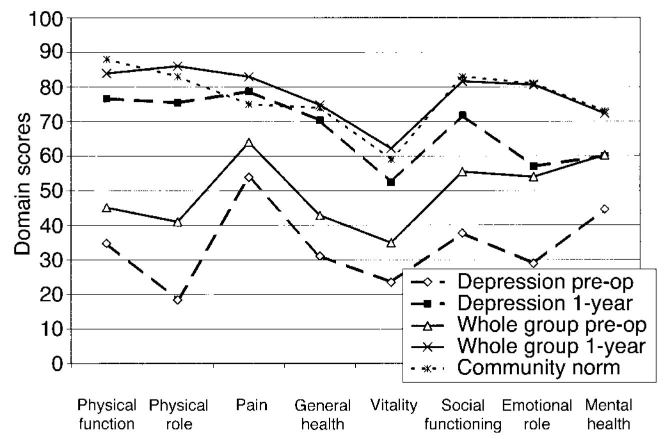

Figure 4: SF-36 domain scales for those indicating a preoperative history of depression ($n = 52$) compared with the whole group ($n = 218$) with paired pre-Lap-Band and 1-year completed surveys.

and pain (Figure 3). A subgroup comparison of those with only lower-limb pain ($n = 40$) and only back pain ($n = 60$) showed that improvements in vitality, social function, emotional role, and mental health were significantly greater in those with only lower-limb pain. All subjects reporting lower-limb pain preoperatively ($n = 98$) had significantly lower preoperative scores and greater improvements in all eight domains of the SF-36, compared with the remainder of subjects.

Responses of Patients with Depression

In contrast to arthritis and joint pain, especially lower-limb pain, where there is a strong return of most SF-36 domain scores to normal at 1 year after surgery, depression is also a common condition associated with significantly lower domain scores preoperatively across the physical and mental spectrum (Figure 4). For those with depression as a preoperative condition ($n = 52$; 24%), there was a greater than average improvement in one domain only, physical role. At 1 year, subjects with a history of depression had significantly lower scores for all domains compared with those without a history of depression (unpaired Student's t test, data not shown). This effect is shown in Figure 4, with the discrepancy in mean scores toward the mental end of the spectrum most marked.

Influence of Weight Distribution and Insulin Resistance

Weight distribution was measured by the waist-to-hip ratio, and insulin sensitivity was measured by the homeostatic model assessment preoperatively. These measures, which are both important measures of cardiovascular and metabolic risk, did not correlate with any of the SF-36 domain or summary score scores preoperatively ($n = 459$), at 1 year ($n = 320$), or with the change in score in the first year ($n = 218$ paired).

Effect of Complications on QOL

Perioperative complications have been too infrequent (<1.5%) to analyze. The most common complications after Lap-Band surgery were the late complications of prolapse (slippage) of the stomach through the band and erosion of the band into the stomach. During the course of the study, 84 patients required revisional surgery for prolapse, and 20 for band erosion. The scores from the most recently completed annual SF-36 survey for each patient who had suffered a complication were examined. These questionnaires were completed at a mean of 33 months after the original band placement, and all were completed after the complication had been managed. The responses of this subgroup to the questionnaire were not different from those who had not experienced a complication requiring revision, with a PCS score at last follow-up of 50.9 ± 9.8 and an MCS score of 48.1 ± 8.3.

Discussion

This study confirms the significant impairment in QOL suffered by people with a BMI of 35 kg/m^2 or greater (9,19). Furthermore, it clearly demonstrates the major and sustained improvement in QOL, as measured by the SF-36 questionnaire, in these subjects after Lap-Band obesity surgery. There are now many studies that have consistently shown an improved QOL after a range of obesity procedures (20–23). More recently, similar improvements have been reported after Lap-Band surgery (11,12,24). However, these studies have not followed a large number of patients serially using the same measuring instrument.

Our study shows that severely obese subjects have impairment of all the domains measured by the SF-36 and that all of these domains are significantly improved and become closer to CNs after surgery. Choban et al. (10) reported that, at 1 year after obesity surgery, some domain scores exceed those of the CN. We confirm their finding and have demonstrated that this effect is temporary and, for the domains of physical role, pain, and vitality, there is a small but significant fall back to CN mean values by 4 years. This early weight loss effect may reflect some short-term euphoria and relief that a long-term disability has been relieved. It is reassuring that the fall in QOL with time after surgery is small, with scores remaining similar to those of the CN values rather than returning to the preoperative state. Our study confirms the findings of Katz et al. (8) that obesity affects the physical more than the mental components of the SF-36 scoring.

One striking and surprising feature of the present study is that the extent of weight loss, as measured by the percentage of excess weight loss at 1 year, was not a major predictor in improved QOL at 1 year after surgery. In fact, the percentage of excess weight loss at 1 year had an impact on one domain only, general health, and in none of the scores was the lowest the percentage of excess weight loss at the 1-year quartile significantly different from the highest quartile. It should be noted that all patients lost weight and that 95% lost $>$11.8 kg. Age and comorbidity seem to play a more dominant role in predicting the degree of improvement of QOL. It is understandable that those more impaired stand to gain more from weight loss. We have previously shown that a low PCS score preoperatively is a predictor of lower percentage of excess weight loss at 1 year after surgery (25). Thus, those more physically impaired may lose less weight but gain more in QOL.

Two important comorbidities of obesity, arthritis/joint pain and depression, seem to have a major impact on preoperative QOL, affecting both mental and physical components. This study demonstrates a difference in the way people with these conditions change after Lap-Band surgery. Subjects with preoperative arthritis/joint pain have greater improvement than do other patients in seven of the eight domains at 1 year, with measures close to those of CNs. Those with lower-limb pain report significantly greater improvement than do back pain sufferers and for several domains are significantly above CN levels. In contrast, those reporting a history of depression preoperatively have improvements in QOL that are similar to the remainder and demonstrate residual impaired QOL, especially in domains focusing on mental health. This may indicate that comorbidity directly caused by obesity, such as the commonly reported knee, ankle, and foot pain, completely resolves in many cases leading to dramatic improvements in QOL. Osteoarthritis of the knees is strongly associated with obesity, especially in women (26). Joint pain, which affects the majority of our severely obese patients presenting for surgery, has previously been shown to have a high prevalence and has a major impact on QOL measures in the obese (27).

The nature of the relationship between obesity and depressive illness remains unclear (28). Although some studies have shown an increase in the prevalence of mental illness in the severely obese (29), a causal relationship has not been established. The severely obese person certainly suffers discrimination (30) and major psychosocial disturbance (31), which may aggravate a depressive illness, and the limited improvement in the mental domains of the SF-36 may reflect improvement in these factors. Depression as an illness does not resolve completely with weight loss, and this requires consideration during the follow-up period after obesity surgery.

In addition to a history of depression, two important factors—younger age and developing a weight problem at a later stage in life—are associated with low MCS and mental health scores. These factors had independent effects, and the mental impact of the late development of a significant weight problem in a younger adult may be considerable. This may also indicate some mental adaptation to the obese state in those who have had a weight problem throughout much of childhood and for those in our group who are older.

Comorbidities of severe obesity that are most life-threatening are those associated with cardiovascular risk. These include central obesity, hypertension, impaired glucose tolerance, and dyslipidemia, all associated with the metabolic syndrome and reduced insulin sensitivity. Our study has not found a relationship in the severely obese between measures of the metabolic syndrome and impaired SF-36 scores. In this respect, these conditions are relatively silent killers.

Late complications after Lap-Band surgery are of considerable concern and 10% to 15% of all patients may need revisional surgery within some years of band placement. The common significant problems are band slippage (up to 10%) and band erosion (1% to 3%). Fortunately, these can be dealt with surgically and usually laparoscopically. It is very reassuring that patients who have required revisional surgery have excellent QOL outcomes that are not different from the whole group. This confirms the findings of Van Gemert et al. (32), where surgical complications did not affect QOL outcome, and we have previously reported excellent QOL outcomes of patients having a Lap-Band surgery after complications or failure of other forms of weight loss surgery (33).

Others have not always been able to report equivalent results. Notably, Morino et al. (34) and DeMaria et al. (35) have reported unfavorable outcomes for small series of patients treated at the beginning of their experience with the Lap-Band. These studies contrast with the larger series so far reported and serve to emphasize the critical importance of technical factors and appropriate patient care in achieving optimal outcome.

In conclusion, severely obese subjects have poor health-related QOL as measured by the SF-36 health survey. Lap-Band surgery for this group provided a dramatic and sustained improvement in all measures of the SF-36.

Improvement is greater in those with greater preoperative disability, and the extent of weight loss is not a good predictor of improved QOL.

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