INTRODUCTION

Roux-en-Y gastric bypass (RYGB) is an effective surgical therapy for weight loss and comorbidity remission in morbidly obese patients, although there are still questions regarding short and long-term outcomes and the effect of the operation on health-related quality of life (HRQL) and psychosocial functions(11).

HRQL is a particularly relevant construct in obesity and weight-loss research because obesity has been shown to negatively affect HRQL, which appears to improve with adequate weight loss(16, 17).

This study aims to analyze the HRQL changes following RYGB in short and long-term follow-ups.

METHODS

Study Design

A controlled cross-sectional design was used. At the same time, a preoperative control group of clinically morbidly obese patients awaiting surgery was compared with two separate groups of patients at two different postsurgical time points: (1) 1-2 years and (2) more than 7 years.

Population

Three groups (50 patients each) were compared: (1) Group A - preoperative morbidly obese patients; (2) Group B - RYGB patients with 1-2 years post-surgery (mean 17 months); (3) Group C - RYGB patients with more than 7 years post-surgery follow-up (mean 112 months) (Table 1).

The preoperative group (Group A) consisted of individuals who were accepted into the program and were scheduled and awaiting surgery. The postoperative groups (Groups B and C) consisted of patients who underwent RYGB at Mandaqui Hospital (São Paulo, Brazil).

Group B subjects were part of a 76 patient group (66% follow-up) with 1-2 years post-surgery follow-up and Group C patients of a 208 patient group (24% follow-up) with more than 7 years post-surgery follow-up.

The groups were similar for gender (A x B $P = 0.2$, A x C $P = 0.4$, B x C $P = 0.2$), age ($P = 1$) and body mass index (BMI) ($P = 0.4$) at the time of the operation.

BMI was different in each of the three groups at the last follow-up (A x B $P<0.001$, A x C $P<0.001$, B x C $P<0.001$).
P<0.001). Group C showed a significant BMI decrease in the nadir weight, reached 1-2 years post-surgery (P<0.001) and weight regain at the long-term follow-up (P<0.001) (Table 1).

**Surgical Procedure**

All of the patients underwent multidisciplinary evaluations at Mandaqui Hospital (São Paulo, Brazil), including history and physical examination by a surgeon, nutritional evaluation by a registered dietitian and psychological evaluation by a clinical psychologist.

Candidates approved for surgery had a BMI >40kg/m², or a BMI >35kg/m² with significant obesity-associated medical conditions, and had minimal medical, dietary, or psychological contraindications for surgery(14).

All of the individuals who underwent surgery received an open-banded RYGB by the same surgical team using standardized methods(2,13). The surgical technique involved the creation of a 30 mL gastric pouch, a 100 cm alimentary limb and a 50 cm biliopancreatic limb.

Informed consent was obtained from all patients. The protocol was approved by the local ethics committee.

**Quality of Life Measure**

The Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) was used to measure the HRQL. It is a validated and reliable generic HRQL instrument that contains 36-items distributed in eight subscales(6,25). The subscales included physical functioning, physical role functioning, bodily pain, general health, vitality, social functioning, emotional role functioning and mental health. These subscales are described in more detail in Table 2. Each of these functional areas was scored separately, with a score of 100 represented optimal functioning.

All of the questionnaires were self-administered.

**Statistics**

The data are expressed as the mean ± standard deviation [range] for the parametric variables (age, BMI) or the median and interquartile range for the non-parametric variables (scores). A paired t-test, the Mann-Whitney U-test, the chi-squared test and an analysis of variance (ANOVA) were used as indicated, and P<0.05 was considered significant.

**RESULTS**

**Quality of Life**

Table 3 shows the HRQL scores for the three groups. The physical functioning, social functioning, emotional role functioning and mental health scales did not vary among the 3 groups (P = 1). The physical role functioning scale was similar in non-operated patients (Group A) compared to short term follow-up patients (Group B), although it decreased in a long-term follow-up (A x B P = 0.2, A x C P<0.001, B x C P<0.001). Bodily pain score is lower in Group B compared to Groups A and C (A x B P<0.001, A x C P = 0.09, B x C P<0.001). Vitality is higher short after the operation (Group B) but lower in the long-term follow-up (Group C), although it is still higher than in the preoperative period (A x B P<0.001, A x C P<0.001, B x C P = 0.03). General health perceptions is better in operated patients (A x B P = 0.02, A x C P = 0.04, B x C P = 0.1) (Figure 1).

**TABLE 1.** Group characteristics before (preoperative) and after (postoperative) surgery

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative</td>
<td>Age (years) 42±11.4 (16-62)</td>
<td>42±10.3 (27-63)</td>
<td>42±10.8 (25-61)</td>
</tr>
<tr>
<td></td>
<td>Gender (% female) 80</td>
<td>82</td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>BMI (kg/m²) 52±8.0 (41-75)</td>
<td>50±7.7 (40-79)</td>
<td>51±6.3 (38-77)</td>
</tr>
<tr>
<td>Postoperative</td>
<td>BMI (kg/m²) 30±5.5 (22-49)</td>
<td>29±4.6 (21-40) - Nadir 36±6.3 (24-49) - Final</td>
<td></td>
</tr>
</tbody>
</table>

Group A: preoperative period; Group B: short-term follow-up; Group C: long-term follow-up; BMI: body mass index; Nadir BMI: reached between 1-2 years; Final BMI: reached at last follow-up

**TABLE 2.** Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) subscales

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Physical functioning</td>
<td>10 items which measure limitations in performance of various physical activities, ranging from vigorous activities to simple self-care functions</td>
</tr>
<tr>
<td>Role physical</td>
<td>4 items which measure functionality in work and others daily activities as a result of physical health</td>
</tr>
<tr>
<td>Bodily pain</td>
<td>2 items which measure degree of pain and pain-related functional limitations</td>
</tr>
<tr>
<td>General health</td>
<td>5 items which measure an individual’s appraisal of their overall health</td>
</tr>
<tr>
<td>Vitality</td>
<td>4 items which measure energy level</td>
</tr>
<tr>
<td>Social functioning</td>
<td>2 items which measure health-related limitations in social functioning</td>
</tr>
<tr>
<td>Role emotional</td>
<td>3 items which measure functionality in work and others daily activities as a result of emotional health</td>
</tr>
<tr>
<td>Mental health</td>
<td>5 items which measure the presence and degree of depression and anxiety</td>
</tr>
</tbody>
</table>
DISCUSSION

Morbid obesity is a worldwide public health problem with an estimated 1.7 billion people suffering from the disease worldwide\(^{8, 20}\). This condition is associated with an increased risk of morbidity and mortality from numerous related medical conditions, such as diabetes, coronary artery disease, and several types of cancer; morbid obesity is also related to debilitating psychosocial consequences\(^{11}\). Poor HRQL has been repeatedly documented in obese patients\(^{21}\), and HRQL impairment relates to increasing BMI\(^{22}\).

Unfortunately, morbidly obese patients respond poorly to traditional dietary and exercise weight-loss regimens, and when an initial response occurs, it is likely to be poorly maintained\(^{23}\). Surgical interventions were developed as an alternative treatment method for morbid obesity, and are aimed at individuals whose weight-loss attempts have repeatedly failed and whose obesity-related medical and psychosocial problems are overwhelming\(^{10}\). Bariatric operations are considered an effective therapy for morbid obesity\(^{24}\) with acceptable complications rates\(^{1}\), sustained long-term outcomes and increased life expectancy\(^{5, 22}\). Several studies using SF-36 questionnaire have shown an improvement of HRQL after bariatric surgery. Dymek et al.\(^{11}\) showed significant improvement in three of the eight SF-36 sub-scales (general health, vitality, mental health) immediately after surgery, although most individuals reported some surgery-related pain and functional limitations. There was a significant improvement in an additional three sub-scales 6 months post-surgery (physical functioning, physical role functioning and social functioning). Similarly, Choban et al.\(^{3}\) examined 53 patients on average 1.47 months (during the rapid weight loss phase) and 23.2 months post-surgery, when the patients had reached a weight plateau. The authors reported continuous improvement of impairments in all areas compared with the preoperative values. At the plateau, the scores were comparable to or even better (emotional role functioning, social functioning, bodily pain, vitality) than the national norm values. Hörchner et al.\(^{15}\), unlike other authors, did not confirm these HRQL improvements after surgically induced weight loss. They found differences in only 3 SF-36 domains (bodily pain, general health and mental health) before and after 1 and 2 years of surgical interventions. These studies results are controversial and limited to 2 years of follow-up, which corresponds to the period of better surgical outcomes in terms of weight loss.

Some recent studies have reported weight regain in a long-term follow-up of operations in 50% of patients, with therapeutic failure (<50% of excess body weight lost) between 7 and 20% after 8 postoperative years\(^{19, 24}\). However, only few studies have addressed HRQL in a long-term follow-up when weight regain is manifest. Interestingly, HRQL seems to be improved even in a long-term follow-up. Dixon et al.\(^{9}\) examined 459 patients before surgery and annually up to 4 years after Lap-Band placement. All of the SF-36 mean scores improved significantly compared with the community norms at the 1-year assessment and remained so for 4 years. Similarly, de Zwaan et al.\(^{7}\) compared a preoperative group

| Table 3. Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) domains scores for the 3 groups (preoperative, short and long-term follow-up) |
|---------------------------------|----------------|----------------|----------------|----------------|
| **A**                          | **B**          | **C**          | **P value**    |
| Physical functioning           | 37 (0-75)      | 100 (75-100)   | 75 (6-100)     | 1              |
| Role physical                  | 77 (50-88)#    | 95 (86-100)*   | 50 (25-68)#    | <0.001         |
| Bodily pain                    | 41 (31-74)&    | 84 (61-100)&   | 51 (22-70)*    | <0.001         |
| General health                 | 54 (40-75)&#   | 92 (87-100)&   | 72 (58-84)#    | <0.001         |
| Vitality                       | 40 (30-70)&#   | 85 (75-90)&    | 55 (40-75)#    | <0.001         |
| Social function                | 56 (37-84)     | 100 (87-100)   | 68 (40-87)     | 1              |
| Role emotional                 | 33 (0-100)     | 100 (100-100)  | 66 (33-100)    | 1              |
| Mental health                  | 58 (33-75)     | 90 (80-92)     | 66 (48-83)     | 1              |

Group A: preoperative period; Group B: short-term follow-up; Group C: long-term follow-up.

Data are presented as median (interquartile range 25-75). Like symbols (&, #, *) differ \(P<0.05\).

In the present study, we showed that three (social function, emotional role functioning and mental health) of four mental health related domains of SF-36 survey did not change, because these domains, as previously observed, are probably less impaired by obesity\(^7,9\). Among the physical health related domains, only physical functioning, which measures the limitations in physical activity performance, did not change. This fact might be attributed to the irreversible effects of some comorbidities, such as cardiovascular disease and arthropathy\(^9,18\). In a different manner, physical role functioning which measures functionality in work and others daily activities as physical health, did not improve in the short-term. Physical role functioning was also lower in the long-term follow-up compared to the initial measurements; we believe this result is linked to aging and the decreased motivation related to aging since the groups had similar ages at the time of operation, but the last measurements of group C was performed 7 years later\(^9\). Bodily pain showed initial improvement but returned to the pre surgical situation in the long-term follow-up, which may reflect short-term euphoria and the belief that a long-term disability has been relieved what was not confirmed in the long-term follow-up\(^9\). Finally, general health perceptions and vitality, which are related to individual perceptions of overall health and energy levels, improved in the short-term and maintained the improvements in the long-term follow-up, representing the best surgical results.

Our study has some limitations. First, a significant number of patients were lost of follow-up (34% for Group B and 76% for Group C). Even though a team of Social Workers tried unsuccessfully to contact lost patients, the continental size of Brazil, the pattern of referral, and the characteristics of this population (low income, high mobility) was likely responsible to the high number of patients lost of follow-up. The fate of the weight loss and comorbidities status in these patients is unknown since patients with good outcomes may choose not to continue follow-up as much as patients with worse results may seek another institution. Another limitation is the cross-sectional design of the study. However, all groups were equated on presurgical variables (gender, age and BMI), which suggest that the differences between the groups were indeed because of the different surgical time frames, rather than error or cohort effects.

CONCLUSIONS

Our results showed that RYGB improved HRQL in three SF-36 domains (bodily pain, general health perceptions and vitality) in the short-term and two domains (general health perceptions and vitality) in the long-term follow-up. HRQL showed worse outcomes in the long-term follow-up, which may be related to the following issues: (1) weight regain; (2) the irreversible effects of comorbidities; (3) the recurrence of comorbidities; (4) aging; and (5) decreased motivation.
REFERENCES


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