

A HISTORY OF ADJUSTMENT DISORDER PREDICTS GREATER WEIGHT LOSS
AFTER SLEEVE GASTRECTOMY

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Background: Bariatric surgery is one of the most effective long-term options for treating class III obesity or class II obesity with medical comorbidities; however, a significant number of patients do not achieve the expected weight loss. New studies are needed to find the predictive value of different variables on surgery outcomes.

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Objectives: Our aim was to study a number of physical, medical, and psychopathological variables as potential risk factors for poor outcomes in patients with class II-IV obesity scheduled for sleeve gastrectomy.

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Setting: Sagrat Cor University Hospital in Barcelona, Spain.

Methods: This prospective longitudinal study enrolled a sample consisting of 441 patients from whom a descriptive analysis was obtained. For 235 of them, we performed a comparative analysis between the patients with differing responses to sleeve gastrectomy after a 1-year of

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follow-up. The remaining patients had differing follow-up data or were lost to follow-up. To collect the data, a semi-structured interview was conducted and various tests were administered to assess the patients' psychopathology (Hamilton Rating Scale for Depression, Hamilton Anxiety Rating Scale) and functionality (Global Assessment of Functioning Scale).

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Results: The results show the prognostic relationship between certain presurgery variables and the good or poor outcomes of the bariatric surgery, based on the patients' weight loss. Advanced age, high body mass index, diabetes and respiratory problems-were significant predictors of a poor response to surgery. Contrarywise, a history of adjustment disorder predicted a better response.

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Conclusions: The results allow us to conclude that, beyond well-established physical and medical conditions, a psychopathological study of patients prior to bariatric surgery including adjustment disorders could be predictive of therapeutic response and could help to personalize the follow-up.

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Keywords: Bariatric surgery; Predictive variables; Psychopathology; Adjustment disorders; Sleeve gastrectomy

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INTRODUCTION

According to the World Health Organization, excess weight and obesity are defined as an abnormal or excessive accumulation of fat that can be harmful to health⁽¹⁾. Obesity is a multifactorial condition that represents one of the largest public health problems worldwide⁽²⁾ and has come to be considered an epidemic of the 21st century⁽³⁾.

In recent years the prevalence of obesity has increased⁽⁴⁾ in an upward trend from 13% in 2016 to 18-21% in 2025, according to the results predicted by some studies⁽⁵⁾.

Currently, bariatric surgery is the most effective long-term option for treating class III obesity⁽⁶⁾ and provides significant weight reduction and improvements in comorbid medical conditions, such as diabetes, hypertension, and hypercholesterolemia⁽⁷⁾. Lifestyle changes and maintaining a healthy diet are required to ensure successful results in the medium and long term. The success of surgery can be significantly potentiated in the medium and long term by promoting positive changes of lifestyle, ensuring healthy diets and applying other multidisciplinary approaches⁽⁸⁾.

Obesity has a negative impact on quality of life, with a considerable psychological burden caused by the psychosocial consequences that accompany this illness⁽⁹⁾. Obesity is also related to difficulties in connecting adequately with emotions (e.g., difficulty in identifying and regulating negative emotions and stress, leading to overeating)⁽¹⁰⁾. Numerous authors⁽¹¹⁾ have reported the presence of psychological and eating behavior disorders, especially in those with the most severe levels of obesity; between 30% and 50% of patients with class II, III, and IV obesity who are candidates for bariatric surgery exhibit psychiatric comorbidities⁽¹²⁾. A meta-analysis by Dawes et al.⁽¹³⁾ showed that the most frequent disorders in these patients were depression (19%), binge-eating (17%), anxiety (12%), and suicidal ideation (9%), followed by

70 personality disorders (7%), substance abuse (3%), post-traumatic stress disorder (1%), and
psychotic disorder (1%).

Numerous studies have addressed the influence of presurgical variables on the outcome of
bariatric surgery. Experts consider the outcome of bariatric surgery to be positive when 50% of
75 the pre-intervention excess weight has been lost⁽¹⁴⁾. Unfortunately, this target is reached by
only 20% of patients after undergoing sleeve gastrectomy (SG)⁽¹⁵⁾, a finding that strongly
recommends further studies on weight loss predictors.

METHODS

80 Patients

Our study involved patients of both sexes with class II-IV obesity who underwent treatment in
the outpatient clinic of the General and Digestive Surgery department of Sagrat Cor University
Hospital (Barcelona, Spain) and who were referred to the hospital's psychiatric unit as
candidates for sleeve or tubular gastrectomy. The inclusion criteria were an age of 18–65 years
85 and an understanding of the study's language (Spanish). Patients with severe psychopathology
(such as psychotic disorders and severe depression) with less than 5 years of stability were
excluded. We gathered the sample between September 2016 and October 2020, which initially
consisted of 441 patients who met the inclusion criteria, successfully completed a semi-
structured interview (at least 80% of the items of the evaluation questionnaire), underwent a
90 psychological assessment, and were approved for surgery. All the participants underwent SG,
and the surgical outcome was evaluated at 1 year by calculating the percentage of excess weight
loss (%EWL). The patients with %EWL ≥ 50 (n = 213) were classified into the good outcome
group, whereas the patients with %EWL < 50 (n = 22) were considered as having a poor
outcome. Figure 1 shows the study flowchart.

Procedures and instruments

Prior to surgery, the assessment tools listed below were employed by qualified psychologists under the supervision of a psychiatrist. Additional measurements of weight and height before and after surgery were provided by the hospital's nutrition service.

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a) *Semi-structured interview*

A semi-structured interview was conducted to gather the sociodemographic and clinical data of the SG candidates. The following variables were included: sex, age, marital status, employment situation, and years of schooling. We also evaluated toxic habits (recurrent use of tobacco, cocaine, marijuana, alcohol, or other drugs), the presence of comorbid physical conditions, and the particular characteristics of obesity (age at onset, childhood obesity, years of progression, possible causes, body mass index (BMI), previous treatments for obesity, and assessment of binge eating according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition [DSM-5]). We likewise assessed the family psychiatric history, the history of eating behavior disorders, previous and current psychopathology, and the use of related pharmaceuticals. The psychopathological assessments were performed according to the DSM-5.

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b) *Scales for evaluating psychopathology*

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Hamilton Rating Scale for Depression⁽¹⁶⁾

The Hamilton Rating Scale for Depression was employed to assess the patients' symptomatologic profile and depression severity. The scale consists of 17 Likert-type items, the sum of which provides a total score from 0 to 52. Total scores of 7 or less (to be expected in the general population) indicate an absence of depression, whereas a score of 18 or more

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indicates the presence of major depression. This scale has been validated in Spanish and has good metric properties (internal consistency, 0.74; test-retest accuracy, 0.92)⁽¹⁶⁾.

Hamilton Anxiety Rating Scale⁽¹⁷⁾

125 The Hamilton Anxiety Rating Scale has 13 Likert-type items that rate the psychological, behavioral, and physical aspects of anxiety and depressive states of mind. For each item, the symptom severity is rated from 1 to 4. The total score is the sum of the items and can range from 0 to 56. A score of 5 or lower indicates the absence of anxiety, whereas 15 or higher indicates moderate or serious levels. This scale has been validated in Spanish and has good
130 metric properties (internal consistency, 0.89; test-retest accuracy, 0.92).

c) *Functionality evaluation scales*

Global Assessment of Functioning⁽¹⁸⁾

The Global Assessment of Functioning (GAF) scale rates the extent to which a patient's
135 condition or symptoms affect overall functioning (social, occupational, and psychological activities). The scale uses a single item for rating, scored on a scale from 1 (persistent danger or expected death) to 100 (absence of symptoms and satisfactory activity in multiple areas). Higher scores indicate a better level of activity. This scale has been validated in Spanish and has good metric properties (internal consistency, 0.89; test-retest accuracy, 0.92)⁽¹⁷⁾.

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Family relationships

The patient's relationship with their family was rated on a numerical scale from 0 to 10, with 0 being no family relationship and 10 being a very good family relationship. This scale was created *ad hoc*.

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Ethics statement

This study was approved by the hospital's scientific research ethics committee. The patients provided their signed informed consent for the use of their test results, as well as for the use of the information given during the interview. Encrypted data were used at all times to protect
150 each participant's privacy.

Statistical analysis

We performed the data analysis using the statistical program G-Stat. We first performed a descriptive analysis to assess the sociodemographic and clinical variables gathered from the
155 patients. We then performed a comparative analysis between the groups with good and poor surgery outcomes, employing logistic regression. We used the Cornfield correlation to find group differences and calculate odds ratios with 95% confidence intervals in order to quantify the influence of pre-surgery variables (presented in dichotomous terms: presence/no presence) on the response variable (good or poor outcome). We considered group differences statistically
160 significant when $p < 0.05$.

RESULTS

Descriptive analysis

The sample consisted of 441 patients, 344 (78%) of whom were women. The most common
165 marital status was married (51.7%). In terms of professional level, over half (62.13%) of the sample was employed at the time of the assessment. As for the educational level, 46.94% of the sample had a secondary school education, and 35.15% had a university education.

Regarding toxic habits, 16.79% of the sample smoked tobacco and 7.94% consumed alcohol. Figure 2 shows the most common medical conditions. Regarding previous obesity treatments,
170 96.15% reported having followed diets, 49.89% had used pharmaceuticals, 12.47% had

undergone a gastric balloon implantation, and 5.22% had undergone previous SG. Sixty-nine percent reported having a history of obesity in the family, and 33.79% had had obesity since childhood.

175 Figure 3 lists the possible causes of obesity, and Figure 4 summarizes the findings of the psychopathological evaluations. At the pharmacological level, 31.81% of the sample was undergoing therapy (16.02% with selective serotonin reuptake inhibitors, 13.73% with benzodiazepines, and 3.66% with dual anti-depressant drugs). However, 50.57% of the sample reported having followed a psychiatric pharmacological therapy at some point in their life.
180 Lastly, 23.87% of the sample reported having undergone psychotherapy at some point in their life, and 7.27% were currently undergoing this type of therapy.

Comparative analysis between the patients with different responses to the surgery

A 1-year follow-up was completed for 235 patients undergoing SG. The rest of the patients had
185 differing follow-up data or were lost to follow-up. We observed that the patients with poor outcomes had a higher mean age than the good outcome group (52.86 ± 11.12 vs. 47.39 ± 10.46 years).

Focusing on the sample's medical conditions (Table 1), there were significant intergroup
190 differences in the frequency of diabetes and respiratory conditions. Results demonstrated a diagnosis of diabetes prior to SG was an indicator of poor prognosis, given that the group with poor outcomes had more than double the number of diabetes cases. Respiratory conditions were also associated with poorer SG outcomes. We observed a tendency in certain variables that are associated with a greater risk of poor outcomes (e.g., having sleep apnea and locomotive

195 apparatus problems). When the history of obesity was considered (Table 2), the presurgical BMI was significantly lower for the patients who later exhibited better treatment outcomes.

Examining the sample's prior and current psychopathology (Table 3), we observed that a history of adjustment disorder appeared to entail a better surgical outcome. Although not
200 statistically significant, we observed a number of psychopathological tendencies that point toward poor SG outcomes; this applied to variables related to anxiety, psychotic disorder, persistent previous depression, eating habits such as grazing and binge eating, and having persistent depression at the time of the assessment.

205 Table 4 shows results obtained from psychopathology and functionality scales, and demonstrates a significant, but very small difference between groups on the GAF indicating better activity and overall functioning in social, occupational and psychological activities for individuals in the good surgical outcome group.

210 **DISCUSSION**

The aim of the present study was to examine various factors associated with good and poor surgical outcomes in a sample of SG patients. Concerning weight loss, the outcomes observed were similar to those reported by other authors⁽¹⁹⁾. In our sample, older age was associated with a higher probability of not losing 50% of presurgery excess weight. In this respect, our results
215 confirmed those of earlier studies and showed that age is a relevant variable in predicting weight loss after SG, with younger patients achieving better results⁽²⁰⁾. The explanation for this could be related to the fact that younger patients have fewer medical comorbidities, more mobility, and shorter disease progression⁽²¹⁾. Although a number of studies have asserted that

there is no relationship between age and SG outcomes⁽²²⁾, our data indicate that older
220 individuals could benefit from closer postsurgery monitoring.

At the medical level, results indicated that the presence of diabetes and respiratory problems
was associated with poorer SG outcomes, as evidenced by an approximately 2-fold increase in
the number of patients unable to reach their therapeutic target within these groups. A number
of studies have suggested a lack of association between the presence of medical comorbidities
225 and SG outcomes within the first 3 years postsurgery; however, results of this study
demonstrated poorer weight loss results among individuals with medical comorbidities ⁽²³⁾.
Toxic habits in the present study did not appear to have a direct influence on the SG outcomes.

The two patient groups did not differ in their lifetime prevalence of psychopathological
230 disorders, a finding that tended to refute the hypothesis that any type of psychopathological
history influences the surgical outcome. However, having had an adjustment disorder was
found to be clearly associated with a better surgical outcome. The latter could be explained by
a higher motivation to accomplish the recommended postsurgical dieting by these patients, who
are possibly experienced in following pharmacological and psychological treatments for short
235 episodes of anxiety or depression. This hypothesis should be tested by new studies that consider
compliance with the diet. The frequency of patients with either a history of generalized anxiety
disorder (GAD) or a diagnosis of GAD at the time of the intervention tended to be higher in
the group with poorer SG outcomes, however significant differences were not achieved. A
number of studies have shown that anxiety triggered by obesity is an indicator of success in
240 weight loss from SG⁽²⁴⁾. However, other short-term studies have found that patients with a
psychopathological disorder, especially an anxiety disorder, showed poorer weight loss results
6 months after the SG⁽²⁵⁾. A recent report suggested that the predictive effect of anxiety on
weight loss after bariatric surgery could depend on the patient's actual anxiety level at the time

of the postsurgical evaluation; thus, moderate levels of anxiety-related disorders were initially
245 found to be associated with a shallower weight loss trajectory but with a steeper slope for
subsequent weight regain⁽²⁶⁾. Clearly, further studies are needed to establish the precise
relationship between presurgical anxiety and surgical outcomes over time.

Similar to GAD, the presence of a psychotic disorder at the time of our study's intervention
tended to be associated with poorer results at the 1-year follow-up after the bariatric surgery,
250 but again this difference did not reach the threshold for statistical significance. Highly rigorous
criteria exist for approving SG for patients with psychotic disorders, such as having a favorable
report from their current psychiatrist, compliance with the medical prescription, and being
stable for years. However, these criteria should be even more rigorous to ensure good adherence
to treatment and better results after surgery. In summary, the tendencies observed in our study
255 concerning anxiety and psychotic disorders agree with those findings in the literature showing
that the presence of active psychopathology at the time of SG predicts less weight loss after
SG⁽²⁷⁾. According to a number of authors, poorer outcomes are mostly expected in patients
diagnosed with 2 or more psychiatric disorders, who are at higher risk of regaining weight
during the first year after the operation⁽¹⁵⁾.

260 Another finding of our study that agreed with the literature showed that the higher the BMI,
the poorer the SG results⁽²⁸⁾. The presence of a higher BMI could indicate that the patient also
has more organic complications, such as diabetes and respiratory problems (mostly sleep
apnea). On the other hand, having had obesity for longer did not lead to poorer results, although
we observed a tendency for the group with poor outcomes to have had obesity for longer on
265 average than the group with good outcomes.

Limitations and Future Directions

We would like to note that the present study was a limited, prospective, longitudinal study, and the results are not generalizable, given that the sample was specific to the Psychiatric
270 Department of Sagrat Cor University Hospital. Therefore, the sample's demographic and sociocultural characteristics should be considered when comparing this research with other studies. Despite the large initial sample (441 patients), the substantial number of patients who were later excluded from the study reduced the final poor outcome group to a small size (22 patients). This low number adds to the imbalance in size with the good outcome group, which
275 was expected according to the literature⁽¹⁹⁾. As a result, the very low number of patients in some groups did prevent the obtention of statistically significant differences, hence some of the tendencies observed in our study will require larger sample sizes to be convincingly established. New studies will also benefit from adding other types of variables to those related to weight loss to properly evaluate surgical outcomes. Although %EWL is still widely used in
280 clinical settings⁽²⁹⁾, it is clear that many patients who maintain their weight in the overweight or even class I obesity range experience significant improvements to their health and quality of life that can hardly be deemed unsuccessful.

CONCLUSIONS

285 The present study focused on analyzing and determining variables of predictive value in SG that could help improve complementary therapies for obesity. Thus, identifying those variables and their significance can help professional teams establish the situations in which more thorough patient monitoring will be required to achieve the highest possible percentage of cases with good outcomes. The factors clearly leading to a poor SG outcome in our study were
290 advanced age, high BMI, diabetes and respiratory problems, whilst patients with a history of adjustment disorder better responded to surgery as compared with subjects devoid of these antecedents. The contribution of anxiety and psychosis was not fully demonstrated but the

tendencies observed recommend a close monitoring of these psychological variables together the former risk factors before bariatric surgery.

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Disclosures

The authors have no commercial associations that might represent a conflict of interest in relation to this article.

Abbreviations

BMI: Body Mass Index

BS: Bariatric Surgery (including all techniques)

CEIC: Sscientific research ethics committee of the Hospital

DSM-5: Diagnostic and Statistical Manual of Mental Disorders-5

GAF: Global Assessment of Functioning Scale

HARS: Hamilton Anxiety Rating Scale

HDRS: Hamilton Rating Scale for Depression

HUSC: University Hospital Sagrat Cor de Barcelona

MO: Morbid obesity

OR: Odds Ratio

SG: Sleeve Gastrectomy

WHO: World Health Organization

Highlights

- A previous diagnosis of adjustment disorder is predictive of a better surgical outcome.
- Older patients have a higher probability of therapeutic failure after surgery.
- The presence of diabetes predicts a poorer bariatric surgery outcome.
- Respiratory problems predict a poorer bariatric surgery outcome.
- The higher the BMI, the poorer the results of bariatric surgery.

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