

## Abstract

Patients (n=31) who were diagnosed with multiple sclerosis (MS) and underwent bariatric surgery at the Cleveland Clinic between 2008 and 2015 were included in this retrospective data analysis. Paired-samples t-tests were used to examine changes in PHQ-9 scores between the year prior to surgery and at various time points following surgery. We also examined the proportion of individuals referred for behavioral health services at our treatment center for MS. Results revealed that on average, individuals demonstrated a mild level of depression in the year prior to surgery, and about half carried a diagnosis of depression at the time of surgery. Patients demonstrated a decline in depressive symptoms on a trend level in the year following surgery. Of individuals with a diagnosis of depression at the time of surgery, 58.8% were referred for behavioral health services either before or after surgery, and of these individuals, 72.2% followed up with services.

## Background

- Multiple Sclerosis (MS) is associated with high rates of obesity, with estimates ranging from 21.2% - 32.7%<sup>1,2</sup>.
- Preliminary evidence indicates that bariatric surgery may be a safe and effective intervention for morbidly obese patients with MS to achieve weight loss and improve function<sup>3</sup>.
- Preoperative depression has the potential to adversely impact postoperative weight loss outcomes—particularly when it remains untreated<sup>4</sup>.
- However, bariatric surgery has been shown to reduce depressive symptomatology<sup>5</sup>.
- Individuals with MS experience rates of lifetime depression in the range 25-50%<sup>6</sup>, and these rates may be further increased in obese patients with MS<sup>7</sup>.
- Despite the relevance of depression in MS, depression is often missed or undertreated in this population<sup>8</sup>.
- There are no published studies documenting the impact that bariatric surgery may have on depressive symptoms in this population.
- Since depression in individuals with MS is often unrecognized or inadequately treated, it will be useful to discern whether obese individuals with MS are appropriately referred for treatment and whether this population appropriately utilizes services.

## Objective

- The current study aims to gain a better understanding of the prevalence and nature of pre- and postoperative depressive symptoms and use of behavioral health services in morbidly obese individuals with MS seeking bariatric surgery.

## Methods

### Procedure

- With Cleveland Clinic IRB approval, Electronic Medical Records (EMR) were retrospectively reviewed for ICD-9 diagnosis of MS at the time of bariatric surgery, yielding 31 patients with a comorbid diagnosis of MS who underwent bariatric surgery at our site between 2008 and 2015.
- Patient Health Questionnaire (PHQ-9) data were collected at medical visits within the Neurological Institute as part of the Knowledge Program.
- Measures of functioning including the Timed 25-foot Walk Test, the 9-Hole Peg Test, and the European Quality of Life Five Dimensions Questionnaire (EQ-5D) were collected during routine Neurology visits.
- Diagnosis of a mood disorder at the time of surgery, pre- and postoperative behavioral health consults, and follow-through with behavioral health services were determined via EMR.
- Due to the varying time spans between PHQ-9 administrations, scores were grouped into categories consisting of: >3 years prior to surgery, 1-3 years prior to surgery, <1 year prior to surgery, <1 year post-surgery, 1-3 years post-surgery, and >3 years post-surgery.

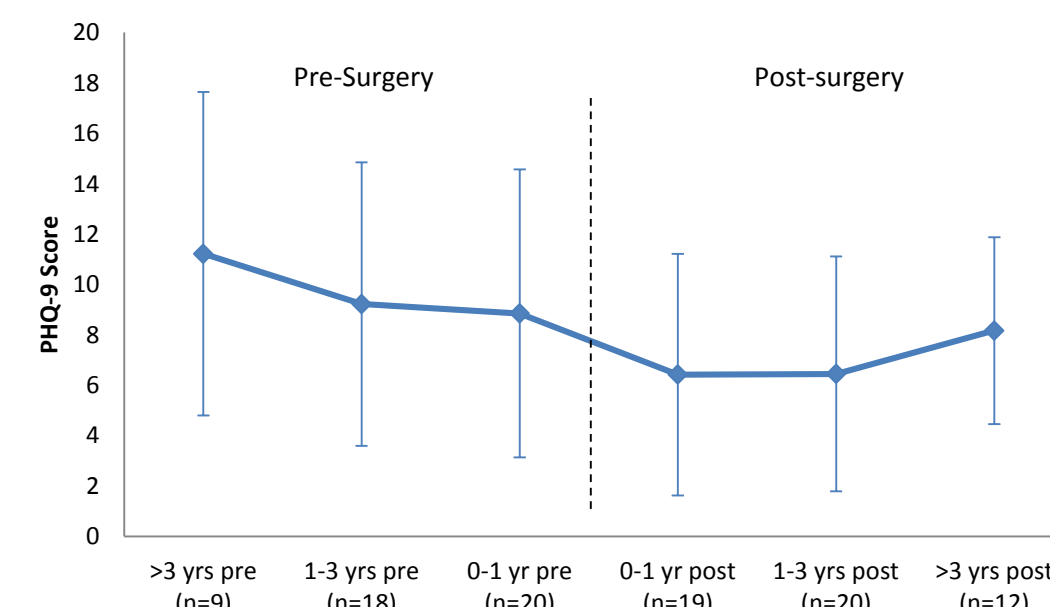
### Analyses

- In the whole sample and in individuals with depression, changes in pre- and post operative PHQ-9 scores between the year prior to surgery and at various time points following surgery were compared using paired-samples t-tests.
- Differences in depressive variables between individuals with and without a diagnosis of depression were compared using independent sample t-tests
- Descriptive statistics were examined to determine proportion of individuals referred for behavioral health services at our treatment center for MS.

## Results

- 17 patients with pre- and post-surgical scores demonstrated a decline in depressive symptoms on a trend level from the year prior to surgery to the year following surgery ( $t=1.76$ ;  $df=16$ ;  $p=.09$ ). This difference was not significant in the 1-3 years (n=14), or >3 years (n=7) following surgery.

Figure 1. Changes in PHQ-9 scores over time in whole sample



- In individuals with a diagnosis of depression, 9 patients with pre- and post-surgical scores demonstrated a significant decline in depressive symptoms between the one year prior to surgery and in the 1-3 years following surgery ( $t=3.7$ ;  $df=8$ ;  $p<.01$ ). This difference was not significant 0-1 years following surgery (n=11) or >3 years following surgery (n=6).
- Individuals with a diagnosis of depression demonstrated significantly higher depression scores than individuals without a depression diagnosis in the 1-3 years prior to surgery ( $t=2.2$ ;  $df=16$ ;  $p=.04$ ). There were no other significant differences in depression scores between individuals with and without a diagnosis of depression at any time point.

Figure 2. Differences in PHQ-9 scores over time between individuals with and without a diagnosis of depression at the time of surgery

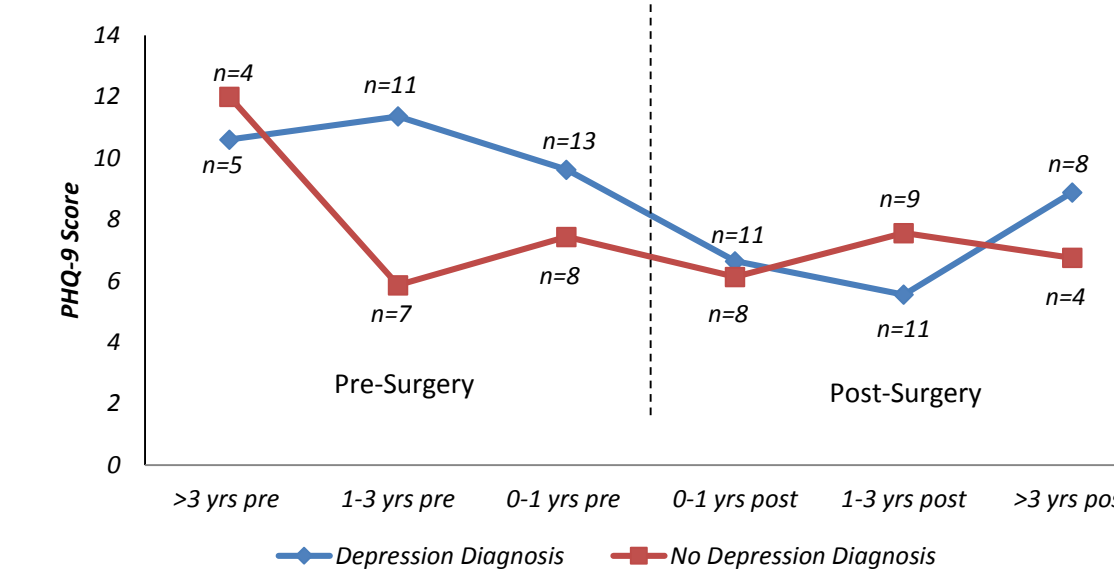
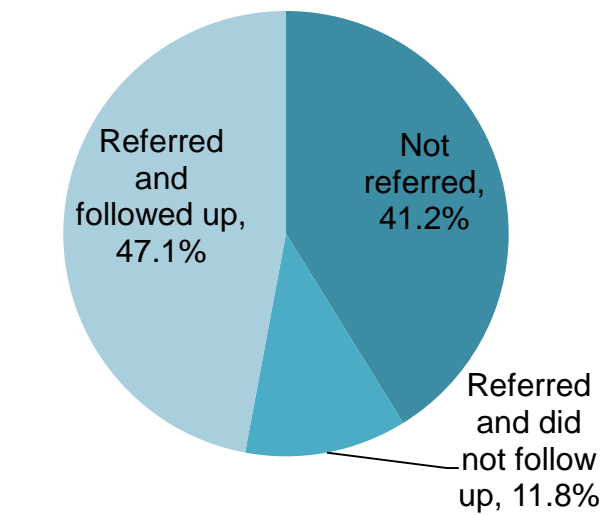


Table 1. Pre-surgical descriptive statistics for all participants

Age, M (SD)	49.4 (10.4)
Race (Caucasian), no. (%)	25 (80.6)
Gender (Female), no. (%)	29 (93.5)
BMI (kg/m <sup>2</sup> ), M (SD)	44.2 (5.6)
Type of Surgery	
RYGBP, no. (%)	23 (74.2)
SG, no. (%)	3 (9.7)
Revision, no. (%)	5 (16.1)
Type of MS	
Primary Progressive, no. (%)	1 (3.2)
Relapsing Remitting, no. (%)	24 (77.4)
Secondary Progressive with Relapses, no. (%)	3 (9.7)
Secondary Progressive without Relapses, no. (%)	3 (9.7)
Timed 25-foot Walk Test (seconds), M (SD)	10.07 (6.3)
9-Hole Peg Test (seconds), M (SD)	31.6 (17.9)
EQ-5D	0.75 (0.44)
Time from MS diagnosis to surgery (Years), M (SD)	11.2 (8.5)
Depression diagnosis at surgery (Yes), no. (%)	17 (54.8)
Antidepressant at time of surgery (Yes), no. (%)	20 (64.5)
Referred for Behavioral Health Services (Yes), no. (%)	18 (58.1)
Follow-up with Behavioral Health Services (Yes), no. (%)	13 (41.9)

Note. RYGBP = Roux-en-Y Gastric Bypass; SG = Sleeve Gastrectomy; Revision = RYGBP revision to previous surgery; EQ-5D=European Quality of Life Five Dimensions Questionnaire

Figure 3. Utilization of behavioral health services in individuals with a diagnosis of depression (n=17)



- Time from surgery to referral ranged from 7.5 years prior to surgery to 5.3 years post-surgery (M=1 year prior to surgery, SD=3.1 years).

## Conclusions

- These results provide a novel finding that greater than 50% of patients with MS who underwent bariatric surgery at our site carried a diagnosis of depression at the time of surgery. This percentage is on the higher end of general estimates of depression in MS<sup>6</sup> and higher than estimates of depression in individuals who undergo bariatric surgery without MS<sup>5</sup>.
- Bariatric surgery does not appear to adversely impact depressive symptoms in patients with MS and, in fact, this preliminary data indicates that patients may demonstrate a slight improvement in symptoms.
- Current data suggest appropriate referrals to mental health services and high utilization of services when referrals are placed.
- These results add to the emerging literature documenting support for use of bariatric surgery in patients with MS
- Due to the nature of this preliminary data, we did not account for additional variables which may impact pre-and post-operative depressive symptoms. Additional research in this area is warranted.

## References

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