

Effect of Metabolic and Bariatric Surgery on the Clinical Course of Multiple Sclerosis in Patients with Severe Obesity



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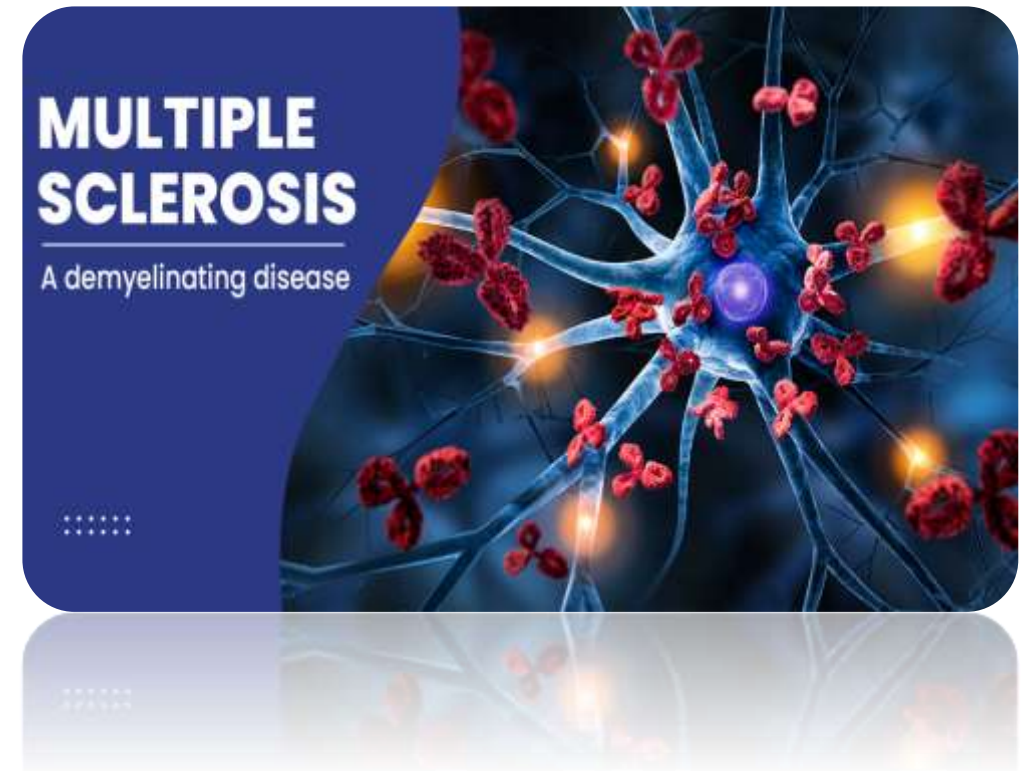
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I have no potential conflict of interest to report



Introduction

Multiple sclerosis (MS) is an **autoimmune chronic inflammatory** disease, and it is the most common acquired chronic demyelinating disease that can involve the white and gray matter of the central nervous system (CNS).



Introduction

- The estimated global prevalence of MS is about 33 per 100,000 people, and there is about 2.3 million people that are affected by MS around the world which seems to be underestimated .
- The etiology of MS is multifactorial, and in addition to the genetic predisposition, vitamin D deficiency, smoking, Epstein–Barr virus (EBV) infection, obesity in early stages of life, and the human gut microbiota can play a role in MS pathogenesis

Types of MS

RRMS: Relapsing-remitting MS

SPMS: Secondary progressive MS

RPMS: Relapsing–progressive MS

PPMS: Primary progressive MS



Methods



This review was performed as per the guidelines for systematic review provided by the Cochrane Cooperation and the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines. The following search engines were used **MEDLINE, Scopus, and Web of Science** until February 01, 2023.

Methods

Inclusion criteria

The studies in English about MS following bariatric surgery as an intervention in **original studies, case series, and case reports**

Exclusion criteria

The studies with insufficient data and non-English articles

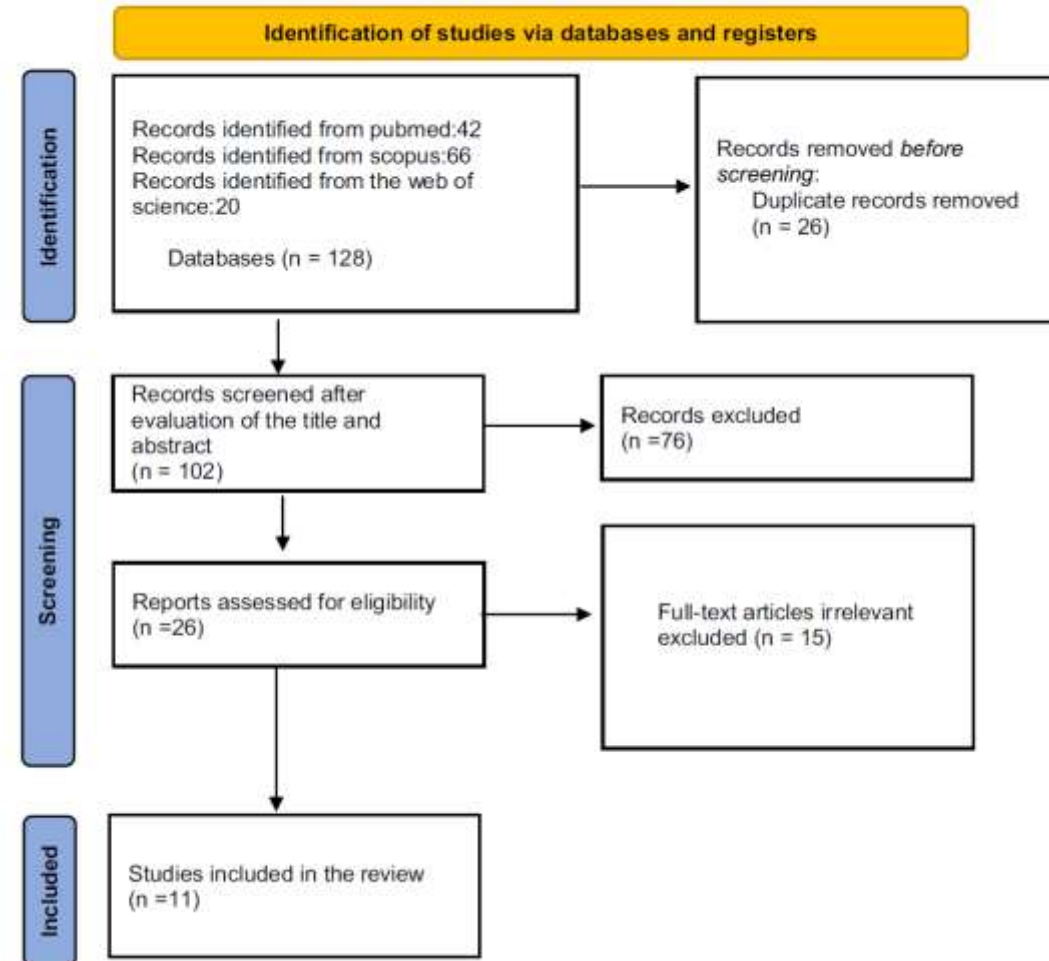
Methods

Data Extraction

- Author
- Publication year
- Type of study
- Number of patients
- Gender (F/M), Age
- Study design
- Types of MS

- MS duration
- Preoperative body mass index (BMI)
- Obesity-associated medical problems
- Type of MBS
- Postoperative complications
- Assessment tool for MS activity
- MS clinical course after MBS

PRISMA CHART



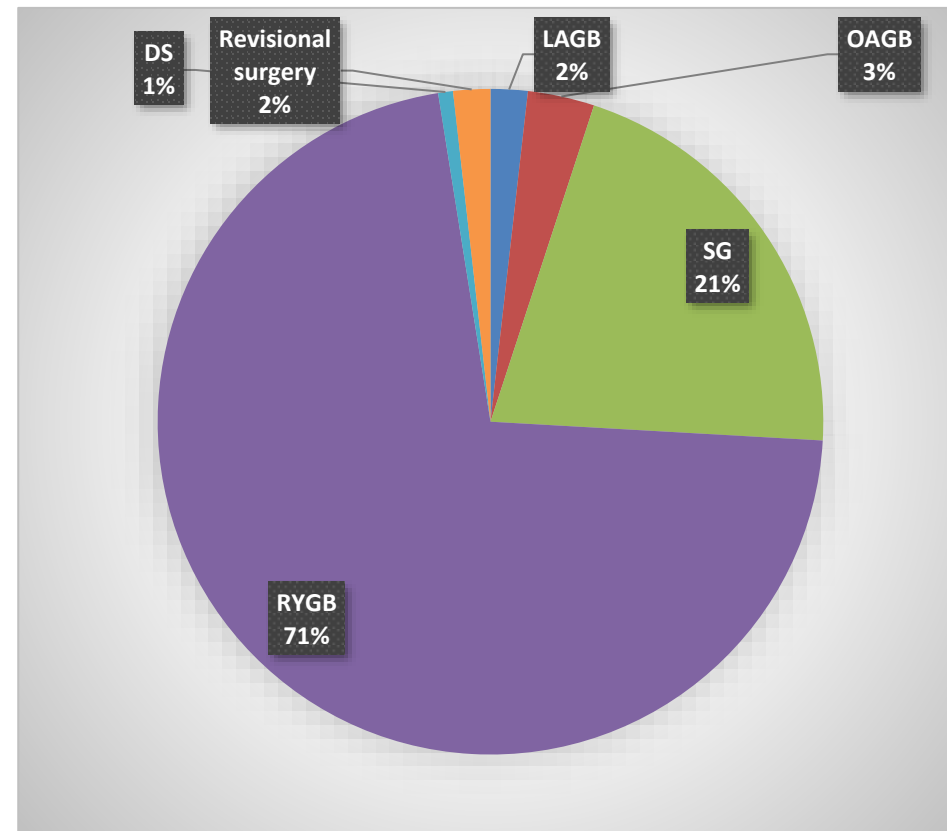
Results

Table1- Mean of the Characteristics of the included patients

Variable	Mean (SD)/ NO (n=370)
Age (year)	41.7 ± 9.6
Pre-op BMI (Kg/m ²)	42.08 ± 4.3
Duration of MS (year)	7.6 ± 4.6
Follow Up (months)	35.5 ± 5.3
Type of MS	
RRMS	287 (77.5%)
SPMS	65 (17.5%)
PPMS	18 (4.8%)

Results

Type of Metabolic Bariatric Surgery



Results

Hypertension (HTN), type 2 diabetes mellitus (T2DM), and obstructive sleep apnea syndrome (OSAS) were the most frequently reported obesity-associated medical problems.

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Table 2 Eligible studies and demographic data for MBS in patients with MS

Author	Study type	Patient (n) (F/M)	Age years	MS type N (%)	MS duration (years)	Pre-op BMI (kg/m ²)	Metabolic- associated medical problems	Other associ- ated medical problems
Asakly et al. (2021) [16]	Case report	1(1/0)	17	N/A	N/A	N/A	N/A	N/A
Lutrzykowski et al. (2008) [17]	Case report	2(2/0)	43.5	N/A	N/A	51.8	DLP: 2, T2DM: 1	OA: 1, neurogenic bladder: 1, paraplegia: 2
Fisher et al. (2018) [9]	Cohort	31(29/2)	49.4 ± 10.4	RRMS 22 SPMS without relapse 3 SPMS with relapse 3 PPMS 2 Other 1	N/A	44.2 ± 5.6	N/A	N/A
Najjari et al. (2021) [18]	Cohort	9(9/0)	35.7 ± 6.7	SPMS 6 RRMS: 3	3.9 ± 2.4	45.3 ± 3.2	N/A	N/A
Anna Karin et al. (2022) [11]	Cohort	122(106/16)	40.30 ± 9.61	RRMS 100 SPMS 18 PPMS 4	10.00 ± 7.54	N/A	N/A	N/A

Results

The MBS outcomes in patients with MS

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Table 3 The MBS outcomes in patients with MS

Author	Type of MBS	Remission/improvement of metabolic-associated medical problems	Postoperative weight loss outcomes	Mean FU (months)	Postoperative complications
Alshamrani et al. (2019) [13]	SG: 3, RYGB: 2	N/A	N/A	24	N/A
Alanazy et al. (2018) [14]	SG: 1	N/A	-At 6 months Δ BMI: 29	18	No complication
Flanagan et al. (1997) [15]	RYGB: 3	N/A	N/A	N/A	No complication
Asakly et al. (2021) [16]	SG: 1	N/A	-At 3 months %EWL: 37%	N/A	N/A
Lutrzykowski et al. (2008) [17]	DS: 2	N/A	-At 30 months %EBMIL: 101.4% -At 48 months %EBMIL: 91.6%	N/A	No complication
Fisher et al. (2018) [9]	RYGB: 23 SG: 3 Revisional surgery: 5	N/A	N/A	N/A	N/A
Najjari et al. (2021) [18]	OAGB: 9	N/A	-At 12 months %TWL: 36.5 ± 7.5	12	Bile reflux, cholecystitis
Anna Karin et al. (2022) [11]	SG (N/A), RYGB (N/A)	N/A	N/A	63.8	N/A

Results

The weight loss outcomes in patients with MS comparing to patients without MS

Author	Weight loss outcomes in patients with MS (n=196)	Weight loss outcomes In patients without MS (n=1960)	P value
Stenberg et al. (2021)	-At 12 months	-At 12 months	
	%EBMIL: 85.7 ± 25.7	%EBMIL: 84.3 ± 24.7	601
	%TWL: 31.9 ± 8.4	%TWL: 31.5 ± 7.9	604
	Δ BMI: 13.2 ± 4.1	Δ BMI: 13.1 ± 3.9	638
	- At 24 months	- At 24 months	
	%EBMIL: 83.6 ± 25.5	%EBMIL: 84.3 ± 26.2	869
	%TWL: 31.6 ± 9.1	%TWL: 31.8 ± 9.2	735
	Δ BMI: 13.2 ± 4.5	Δ BMI: 13.3 ± 4.6	644

There was **no significant** difference observed between weight loss outcomes in patients with MS and control group without MS.

Results

Assessment tool and MS clinical change

- Health-related quality of life (HRQOL)
- 25-foot walk test (T25-FW)
- McDonald diagnostic criteria
- lumbar puncture (LP)
- Expanded disability status scale score (EDSS)
- Brain and spinal cord MRI
- Multiple sclerosis performance scale (MSPS)

Table 5 Assessment tool and MS clinical change

Author	Assessment tool	MS clinical changes
Stenberg et al. (2021) [8]	HRQoL SF-36/RAND physical scores HRQoL SF-36/RAND mental scores EDSS	N/A
Burn et al. (2018) [12]	N/A	- Brief flare-ups of MS symptoms without exacerbation (2 patients) - Approved mobility limitation (1 patient)
Bencsath et al. (2017) [10]	Twenty-five-foot walk test (T25FW)	- No change (11 patients) - Exhibited improvement (4 patients) - Slowing in T25FW (1 patient)
Alshamrani et al. (2019) [13]	McDonald's diagnostic criteria, LP, EDSS score	- Sudden painful blurriness of vision that improved after medication (1 patient) - Sixth cranial nerve palsy of the right eye and proximal lower limb weakness that improved after medication (1 patient) - Bilateral hip paraparesis, urinary incontinence, constipation, and easy fatigability, decreased power in the upper limbs and lower limbs (1 patient) - Dystonic posturing of the left hand with dysmetria and dysidiadochokinesia on the left (basal ganglionic lesion or cerebellar degeneration) (1 patient)
Alanazy et al. (2018) [14]	Brain and spinal cord MRI	- No clinical or radiological relapses after one year, but abnormal eye movement, paresthesia in upper and lower limbs, and imbalance 18 months after surgery
Flanagan et al. (1997) [15]	N/A	- Exacerbation (one patient) - Improvement (one patient)
Asakly et al. (2021) [16]	Brain and Spinal cord MRI/LP	N/A
Lutzykowski et al. (2008) [17]	N/A	-Improvement (one patient)
Fisher et al. (2018) [9]	Patient Health Questionnaire-9 (PHQ-9) and Multiple Sclerosis Performance Scale (MSPS)	-Significantly improved at years 1 ($p < 0.01$) and 2 ($p = 0.03$) after MBS compared to control group
Najjari et al. (2021) [18]	Expanded Disability Status Scale (EDSS)	- Exacerbation (2 patients) - No change (7 patients) after OAGB
Anna Karin et al. (2022) [11]	Expanded Disability Status Scale (EDSS) AND Multiple Sclerosis Impact Scale (MSIS-29)	-No significant difference in the change in physical MSIS between patients after MBS and controls ($p = 0.89$) - Patients after MBS were associated with a median 10.46 increase in MSIS psychological score when compared to controls ($p = 0.013$)

Results

MS clinical course of the surgical and control groups

Table 6 MS clinical course of the surgical and control groups

Author	Surgical MS patients	Control MS patients	<i>P</i> value
Bencsath et al.	N: 16 BMI: 45 ± 4.7 MS duration: 15.6 ± 11.5 years Acute MS exacerbations (<i>n</i>): 2	N: 16 BMI: 43.6 ± 3.7 MS duration: 9.0 ± 4.3 years Acute MS exacerbations(<i>n</i>): 4	N/A
Anna Karin et al.	N: 122 MS duration: 10.0 ± 7.5 years Postoperative relapse rate/year: N/A Time to first postop relapse: 1.17 years	N: 122 MS duration: 10.7 ± 6.9 years Postoperative relapse rate/year: N/A Time to first postop relapse: 1.57 years	0.24 0.52
Fisher et al.	N:31 BMI: 44.2 ± 5.6 PHQ-9 scores: 9	N: 828 BMI: 40.2 ± 4.9 PHQ-9 scores: 5	< 0.01 < 0.01
Stenberg et al.	N: 196 BMI: 41.1 ± 5.5 All aspects of HRQoL: improved	N: 1960 BMI: 41.0 ± 5.6 All aspects of HRQoL: improved	

Take Home Message

1. **Overall improvement** was seen in MS clinical course after MBS compared to control groups
2. There is a **risk for MS exacerbation** in a number of patients after MBS
3. MBS leads to the **same weight loss outcomes** with the same complication rate as in patients without MS
4. MBS may lead to **MS clinical course improvement** and the type of MBS has no significant role in MS clinical course changes after MBS

Take Home Message

5. **There are not enough studies** to uniform evaluation of the MS clinical course after MBS and make a strong recommendation
6. Regular strict nutritional follow-up and control of vitamin status are mandatory in patients with MS

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REVIEW



Effect of Metabolic and Bariatric Surgery on the Clinical Course of Multiple Sclerosis in Patients with Severe Obesity: a Systematic Review

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