

# Improved Outcomes in Multiple Sclerosis Using a Lifestyle Medicine Approach: A Case Study and Patient Perspective

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## Abstract

**Introduction:** Although numerous pharmaceutical agents have been developed to treat multiple sclerosis (MS) and have been shown to improve outcomes significantly, the use of lifestyle therapies has not been well understood or implemented.

**Purpose:** The current case study describes the course of a 48-year-old patient with relapsing-remitting MS who chose to use lifestyle measures to manage her condition.

**Interventions and outcomes:** The patient tried several medications without marked improvement. After 4 years, she decided she no longer wanted to risk medication side effects while still having regular relapses. She adopted a plant-based diet, started exercising as tolerated, and worked on improving her mental health through mindfulness and spiritual practices. During the 12 years after these changes, the patient experienced 5 exacerbations in total. In 2021, magnetic resonance imaging scans were compared with pre-lifestyle change scans; there was some increase in the size and number of T2 bright lesions but no significant lesion enhancement. The patient currently enjoys a quality of life equal to someone without MS.

**Conclusions:** Although pharmaceuticals are the mainstay of MS therapy, a full lifestyle approach in addition to, or instead of, traditional therapies warrant increased attention, especially in patients who are unable to tolerate medication side effects and are committed to making lifestyle changes.

**Keywords:** autoimmune, exercise, meditation, multiple sclerosis, plant-based nutrition

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None

**Introduction**

Multiple sclerosis (MS) is a progressive, degenerative neurological disease that affects the central nervous system. Worldwide, it is estimated that 2.8 million people have MS and that the prevalence is growing rapidly, especially in the pediatric population.<sup>1</sup> Women are between 2 and 4 times as likely to be diagnosed with MS as males. While there is a genetic component to MS, migrational and monozygotic twin studies suggest a strong environmental component as well.<sup>1,2,3</sup>

MS is categorized by 4 main patterns. The relapse-remitting pattern is most common, affecting the majority of those with the diagnosis.<sup>3</sup> It is characterized by the sudden onset of neurological symptoms followed by periods of remission.<sup>3</sup> After 15 years, most patients in this category progress to a secondary progressive pattern which is marked by neurological deficits that are fixed and accumulate over time.<sup>3</sup> Conversely, approximately 10–15% of patients are first diagnosed with a primary progressive pattern where deficits are permanent and increasing from the onset.<sup>4</sup> Finally, a small percentage of patients present with a clinically isolated syndrome (CIS) that consists of at least one neurological episode that lasts for more than 24 hours. Most of these patients will subsequently develop one of the other 3 patterns discussed.<sup>4</sup>

Classified as an autoimmune disease, MS produces inflammation, demyelination, and sclerosis in the white matter of the brain and spinal cord.<sup>1</sup> Proinflammatory T cells, most notably Th1 and Th17, have been observed in demyelination patterns.<sup>5,6</sup> Research has also suggested a relationship between mitochondrial oxidative stress, energy failure, and diffuse axonal injury.<sup>7</sup> Given that the genetic contribution to MS cases is estimated to be less than 30%, significant research has looked at environmental factors that may predispose individuals to developing MS.<sup>8</sup> Smoking, physical activity, and vitamin D intake have been particularly analyzed as modulators of immune function but with mixed results so far.<sup>1,8,9</sup> Promising research is now looking at the impact of intestinal microbiota on MS as the microbiome's role in immune modulation and gut permeability is increasingly being appreciated.<sup>10</sup>

Currently, the conventional standard of care for acute MS attacks includes corticosteroids and plasmapheresis.<sup>7,11,12</sup> To modify disease progression, injectable treatments, such as interferon beta medications, are used as first-line therapies. Various infusion treatments and oral therapies can also be used to reduce relapse rate.<sup>13</sup> However, many of these treatments are accompanied with risks and adverse side effects, such as fever, nausea, skin cancer, leukemia, worsening of vision, and cardiac toxicity. Because of this wide range of adverse side effects, conventional treatments may have a strongly negative impact on quality of life.<sup>9,13</sup>

Integrative therapies and lifestyle modifications, such as exercise, nutrition, yoga, meditation, and acupuncture, have enjoyed considerable interest as treatments for MS.<sup>14</sup> Further, research supports the idea that modifiable and nonmodifiable factors impact prognosis after a diagnosis.<sup>15-21</sup> However, most studies are often limited in scope, investigating only certain behaviors rather than a full lifestyle approach. For example, using diet as a treatment generated considerable interest, but the overall findings related to dietary factors and MS are mixed.<sup>18,22-27</sup> Given the paucity of data and variability between existing studies, these integrative approaches and lifestyle modifications are not part of the standard of care for MS patients and, understandably, practitioners often dissuade patients from trying these unvalidated therapies.

The current case study describes a patient diagnosed with relapsing-remitting MS. After her diagnosis, the patient adopted a full lifestyle approach to manage her condition,



specifically modifying her diet, increasing her physical activity, and focusing on her mental health to reduce remissions and improve overall function and quality of life.

## Case study

### *Patient information and clinical findings*

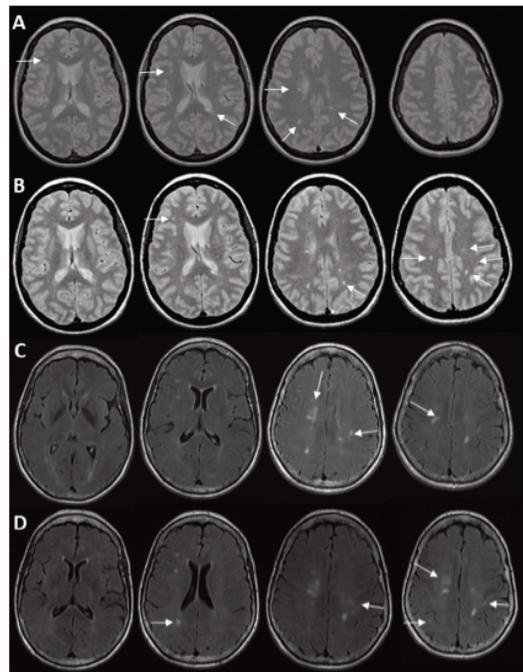
The patient was a white female diagnosed with relapsing-remitting MS in 2004 when she was 48 years old. Her initial complaints were gradual onset of worsening balance and left-sided hearing loss. Before her diagnosis, she was healthy, did not have a family history of autoimmune disease, was pre-menopausal, and had never used tobacco or other drugs. Born in West Africa, the patient had lived mostly in the western United States. She was living in Arizona when diagnosed.

She was subsequently evaluated by a neurologist when work-up with magnetic resonance imaging (MRI) showed some T2 abnormalities. A spinal fluid analysis showed an increased IgG index. Her diagnosis of relapsing-remitting MS was established based on the cerebrospinal fluid findings, a repeat MRI scan, and clinical symptomatology. She began treatment at a neurological clinic and enrolled in a clinical trial. She was given glatiramer acetate injection but withdrew from the trial shortly after because of her aversion to daily injections. She was subsequently switched to a trial comparing fingolimod with placebo, but within several months, she developed macular edema and a pigment epithelial detachment, which resulted in her discontinuation of the treatment.

From 2004 to 2008, the patient had symptom relapses every 6 months despite treatment. These flares included weakness, balance difficulties, worsening diffuse pain, and fatigue; they were exacerbated by stress and sleep deprivation. In June 2008, she decided to stop medication, switch to a plant-based diet, start exercising as tolerated, and incorporate mindfulness into her routine as a holistic method of addressing her MS.

Since incorporating these changes, she has had 2 episodes of worsening symptoms. One occurred in May 2011, and she was treated with intravenous methylprednisolone at home. The second episode occurred after a trip to Malawi in June 2012. Each of these episodes had similar symptomatology, namely, weakness in her upper and lower extremities and a widespread deep, boring, and aching pain. These symptoms seemed to worsen with heat, fatigue, and poor sleep.

In September 2012, she was evaluated at another institution. After another MRI scan, the provider



**Figure 1: MRI Scans**

Notes: Magnetic resonance imaging (MRI) scans of the patient of the current case study since her diagnosis with relapsing-remitting multiple sclerosis. **A.** Initial MRI scan of the patient's brain from May 2007 showing the initially diagnosed T2 bright lesions in the juxtacortical and periventricular white matter (arrows). **B.** Follow-up MRI scan from February 2008 showing and increased number of T2 bright lesions mostly in the centrum semiovale (arrows). **C.** MRI scan from October 2019 showing increased T2 white matter lesions (arrows) mostly in the right periventricular space. **D.** MRI scan from February 2021 showing increased T2 bright lesions in the corona radiata and centrum semiovale (arrows). No marked lesion enhancement was present in any of the brain MRI scans. Images **A** and **B** are axial T2 images because there was no fluid-attenuated inversion recovery (FLAIR) sequence performed. Images for **C** and **D** had a T2-weighted FLAIR sequence performed.



reported, “no evidence of active or increased lesions in the interim since her last MRI,” which was in 2007. Given this encouraging outcome, the patient decided to continue with her holistic approach. In 2013–2014, she completed a half marathon and a 19-mile bike ride. In October 2019, she had a new MRI scan that revealed “several plaques have slightly increased in size since the previous study. There are no enhancing plaques to suggest active demyelination.” No evidence of demyelination in the thoracic spinal cord was found. The patient’s MRI scans are presented in the Figure 1.

In January 2020, the patient visited a neurologist because she was experiencing some dizziness. It was unclear whether her symptoms were related to her MS. She complained of having morning dizziness and that her arms and legs felt weak and rubbery. Her daily activities were not impaired, and the neurological exam at this visit was intact. She declined pharmacological treatment at this visit. Because these symptoms persisted, in June 2020, she increased her lifestyle modification efforts by increasing her vegetable consumption, overall raw food consumption, and flax seed intake. In January 2021, she began focusing her efforts on an anti-inflammatory diet and has since been able to achieve full remission of her symptoms. In addition to diet, she started moderate physical activity and some weight-bearing exercises that focused on all major muscle groups. She improved her sleep hygiene by maintaining a consistent bedtime and making time to sleep a minimum of 8 hours per night. Specific details about her full lifestyle approach are presented in the Table 1.

**Table 1. Lifestyle characteristics of the patient of the current case study since her diagnosis with relapsing-remitting multiple sclerosis**

Year Range	Diet	Physical Activity	Mindfulness and Spirituality	Prescribed Medications
2004–2007	Standard American diet, Vegetable consumption about 10% of diet, Fruit consumption about 10% of diet	Walk 30–40 min, 3–4 times weekly	Meditation once weekly	Copaxone, Fingolimod Steroids (MS exacerbations), Zoloft (depression), Wellbutrin (depression)
2008 <sup>a</sup>	Eliminated meat and cheese, Still eating processed foods, Increased vegetable consumption by juicing	Started lifting weights, using the treadmill, and swimming at a gym 50 min, 2–3 times weekly	Meditation once weekly	None
2009–2011	Vegetable consumption up to 25% of diet, Fruit consumption up to 20% of diet, Eliminated eggs	Walking and/or bicycling 50 min, 4–7 days weekly	Meditation once weekly, Intensive work on forgiveness of someone who had hurt her deeply	None
2012–2015	Vegetable consumption up to 40% of diet, Fruit consumption up to 25% of diet, Reduced processed foods, Introduced flax meal	50 min, 5 times weekly, Ran a half marathon, Completed a 19-mile bike ride	Meditation twice weekly, Transformational prayer practice to work on belief systems and forgiveness, Started counseling	None
2015–2017	Vegetable consumption up to 40% of diet, Fruit consumption up to 25% of diet, Eliminated almost all processed foods, including oil	Walking 50 min, 3–5 days weekly	Meditation twice weekly, Continued prayer practice, Continued counseling	None
2017–2020	Vegetable consumption up to 55% of diet, Fruit consumption up to 25% of diet	Aerobics and weights 40 min, 5 days weekly	Meditation twice weekly, Continued prayer practice	None



**Table 1 (continued)**

Year Range	Diet	Physical Activity	Mindfulness and Spirituality	Prescribed Medications
June 2020-present	Vegetable consumption up to 85% of diet with major increase in consumption of raw vegetables, Fruit consumption up to 15% of diet, mostly consumed raw, Increased flaxseed, avocado, and balsamic vinegar consumption, Decreased consumption of grains and nuts, Eliminated processed foods	Aerobics and weights 40 min, 5 days weekly	Meditation daily	None

Note: <sup>a</sup>The patient adopted lifestyle changes to her diet, physical activity, and mindfulness/spirituality starting in 2008.

### Diagnostic assessment

In 2004, the patient was diagnosed with relapsing-remitting MS and had a cerebrospinal fluid analysis performed. Her IgG index was 0.87, which was considered high, but the other outcomes were within normal limits. Her measured body mass index (BMI) was 26.0, and she had a blood pressure of 151/92 mmHg. Her total cholesterol was 252 mg/dL, triglycerides were 116 mg/dL, high-density lipoprotein (HDL) was 77 mg/dL, and low-density lipoprotein (LDL) was 156 mg/dL. The rest of her comprehensive metabolic panel was within normal limits.

After implementing her lifestyle changes, the patient had a BMI of 21.6 in 2020, and her blood pressure was 126/82 mmHg. In 2021, her erythrocyte sedimentation rate was less than 5 mm/hour, and her C-reactive protein was nondetectable. Her total cholesterol was 178 mg/dL, triglycerides were 124 mg/dL, HDL was 61 mg/dL, and LDL was 93 mg/dL. The total cholesterol to HDL ratio was 2.9. Her hemoglobin A1C was 5.0%. The rest of her comprehensive metabolic panel was within normal limits.

### Patient perspective

When I first heard the words “you have multiple sclerosis,” I felt alone and afraid of the unknown for me and my family. I went for a second opinion and heard the words for the second time, “you have relapsing-remitting multiple sclerosis.” My whole world was crashing.

For the next 3 to 4 years, my world revolved around tests, poking and prodding, medications, shots, and continual pain physically and emotionally. Those were the only options the doctors could offer me. I was depressed, felt hopeless, and just wanted it all to go away. It was hard to hold down jobs as smells such as certain paints, perfumes, or cigarette smoke seemed to trigger exacerbations. With the unpredictability in my health, I started to limit my social interactions and my relationship with my husband felt challenged. Pain and the MS diagnosis became my identity, and I lived out that identity every moment of every day. Then one day, someone told me about a holistic way to treat MS. I was willing to try anything! I had stopped all medication because they just were not working for me. The holistic option was a plant-based diet that eliminated all animal products and included juicing raw vegetables and fruits. As I implemented a whole-foods plant-based diet, I felt better. I saw a biological dentist who removed all toxic metals from my mouth and cleaned up all my gum tissues around existing root canals. After these procedures, I felt more energy.

As part of my journey to allow my body to heal from MS, I have also explored and embraced the spiritual and emotional aspects of my healing. Since I have a belief in God, I knew His teachings on forgiveness, peace, and love but had not always prac-

Improved Outcomes in MS

S. Bansal, G. Pendlebury,  
& P. Oro

ticed or experienced them. I went to several inner healing prayer and counseling sessions that challenged me to explore what I believed. I learned the power of forgiveness both for others and myself. I embraced loving and seeing myself the way God sees me—beautiful, loved, and healed. I saw how the words I say to myself and the choices I made could bring life or death into my body. I chose self-care as an act of healing by practicing healthy boundaries, listening to beautiful music, practicing meditation, taking walks, enjoying friends and nature, practicing deep belly laughing, enjoying coloring for relaxation, and by not overcommitting myself with family and friends.

Over the next 12 years, my health continued to improve. I learned that my body could heal itself when I removed the physical, emotional, and spiritual barriers that were making and keeping me sick. I learned that I have options regarding my health and how to be an advocate for my own health. Pain and MS are not my identity anymore. I want patients who have MS and doctors who treat MS to hear my story in the hope that they will consider both a whole-foods, plant-based diet and medicine as treatment options. I have come to firmly believe in a lifestyle medicine approach that treats the whole person (physically, emotionally, and spiritually) rather than just treating the symptoms with medication.

### Discussion

Seventeen years after her diagnosis, the patient in this case study has been able to markedly reduce the frequency of her relapses, increase her metabolic profile, and maintain a normal quality of life. Although a small percentage of people with MS can remain relatively functional for decades, even off medications, the patient has been able to not only maintain her health but to markedly improve her functionality and overall quality of life through lifestyle changes. As illustrated by her successful use of diet, physical activity, and mindfulness/spirituality to improve health, this multifaceted approach to treatment of MS has strong biological plausibility and some clinical support in the literature. Such combined approaches need to be investigated even though study design may be complicated by multiple factors.

The use of diet to improve MS symptoms has been frequently explored. Swank<sup>24,28</sup> systematically followed MS patients for over a decade, treating them with a low-fat diet and strictly controlling trans and saturated fat intake. Although there was no formal control group, Swank<sup>28</sup> found significant decreases in exacerbation frequency and functional decline in study participants when compared with standard-of-care cohorts and with participant data before the intervention. Other dietary patterns, such as the Wahls Protocol, have also reported some success with smaller cohorts over a 1-year period.<sup>29</sup> A consistent feature of these approaches is their emphasis on a diet rich in unprocessed fruits and vegetables. These foods are well known for their anti-inflammatory and nutrient-rich profiles. When adopting her whole-food, plant-based dietary pattern, the patient placed a similar emphasis on nutrient-dense foods with strong anti-inflammatory properties. After experiencing dizziness in January 2020, the patient eliminated processed foods from her diet and increased her intake of omega-3 fats and consumption of raw fruit and vegetables. These changes provided additional anti-inflammatory support.

In addition to diet, the patient worked on improving her physical activity. She started exercising as tolerated and was ultimately able to run a half-marathon. Postulated mechanisms by which regular exercise can decrease inflammation include decreasing visceral adiposity.<sup>26,30</sup> Further, excess adiposity causes fat cells to release inflammatory factors, such as tumor necrosis factor alpha, interleukin (IL)-6, and monocyte chemoattractant protein 1.<sup>31</sup> These chemokines create an inflammatory en-



vironment, which may trigger MS exacerbations more easily. Conversely, exercise is associated with increases in the downregulating cytokine IL-10 and in IL-1 receptor antagonists.<sup>30</sup> These chemokines may also downregulate toll-like receptor expression on the surface of monocytes, effecting changes that create a less inflammatory environment. Ultimately, physical activity is critical for MS patients to maintain functional capacity through multiple other mechanisms, such as bone health and flexibility.<sup>32</sup> In the current case study, the patient was able to reduce her BMI from the overweight range to a normal range because of her lifestyle changes.

Another part of her lifestyle changes involved addressing her mental health. Mindfulness is a stress reduction technique that has been used for centuries and has recently become popular in the Western world. Standardized practices, such as mindfulness-based stress reduction, have been shown to decrease psychological symptoms.<sup>33-36</sup> More recent research has shown that mindfulness improves immune function.<sup>37,38</sup> A recent systemic review found that mindfulness practices reduced serum C-reactive protein, decreased nuclear factor kappa B activity (a proinflammatory transcription factor), and increased CD4 T-cell activity.<sup>37</sup> By incorporating mindfulness practice into her lifestyle, the patient may have been able to reduce an inflammatory environment that predisposed her to twice annual exacerbations, even on medications. Since depression is associated with poorer health outcomes, the patient's mindfulness practice likely worked on multiple levels to support her overall health.

After adopting lifestyle changes, the patient experienced only 5 exacerbations of her MS between 2008 and 2020, which was approximately half the frequency of exacerbations when she was on medication during 2004–2008. The exacerbations that occurred after 2008 when she was off medication were all preceded by periods of stress, and they were mostly annual occurrences through 2013. Once she was better able to control her stress response and had improved her exercise capacity, in addition to her dietary changes, she did not have further exacerbations until she experienced dizziness in 2020.

Despite the positive changes from her lifestyle changes, serial MRI scans show that there has been a modest increase in overall lesions. Her most recent MRI from January 2021 is the first one to show some lesion enhancement since her adoption of lifestyle changes. However, that scan was obtained while she was having problems with ongoing dizziness and may only be an acute finding.

An important aspect of the current case study is the patient's rejection of standard medical care for MS. She frequently reported feeling unsupported by the medical community. All her doctors had to offer her was medication even though she responded poorly and experienced adverse physical changes from it. If her healthcare providers had worked with her on lifestyle changes, providing resources for coaching and guidance, she may have been more open to integrating better tolerated medications with lifestyle modifications or have remained in contact with a healthcare provider throughout the process. This is an important point given that stopping medications without medical guidance, particularly immunosuppressants such as steroids, can be dangerous and even deadly. Medications have advanced our care of MS significantly and are an important component of treatment. However, considering treatment regimens that include other modalities can be beneficial on multiple levels.

## Conclusion

Case studies such as this highlight the necessity of additional research to better understand the impact of a full lifestyle approach for treatment of MS. The patient's ability to thrive after implementing lifestyle changes is inspiring and points to the potentially



positive cumulative impact of lifestyle changes. Modifications to diet, physical activity, and mindfulness/spirituality may have an integral role in the overall treatment of MS patients and become a beneficial part of a comprehensive treatment strategy. At the very least, lifestyle modifications have the potential to counter some of the adverse effects of medications, such as a higher risk of metabolic syndrome. Finally, incorporating lifestyle factors into treatment plans may help healthcare providers build better rapport with patients while simultaneously providing more tools to counter this disabling condition.

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