

Chronic migraine reversal and prevention with the LIFE diet: a nutrient dense whole food plant-based diet (WFPBD)

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Accepted 21 September 2021

SUMMARY

We report a case of a 60-year-old man who struggled with frequent migraines for 12.5 years, which were refractory to all conventional therapies. Six months before initial consultation, these migraines become chronic. The patient was then advised to follow the Low Inflammatory Foods Everyday (LIFE) diet, a nutrient-dense, dark green leafy vegetable-rich, whole food plant-based diet. Within 2 months, his headache frequency declined from 18 to 24 headache days per month to 1, and he discontinued his preventive and abortive migraine medications. After 3 months, the patient had no headaches. These results far exceed the goal of migraine treatment with medication, which is to reduce migraine frequency by >50% per month. In addition, the results were durable; this patient has been migraine-free for 7.5 years. Serum beta-carotene more than tripled after the patient started the LIFE diet, consistent with its high content of dark green leafy vegetables. Weight, high-sensitivity C-reactive protein (hsCRP), complete blood count (CBC), hydration status, sodium and other electrolytes remained constant throughout the study.

BACKGROUND

Migraine disorder is a major public health concern that affects over 1 billion people worldwide.¹ Migraines are characterised as unilateral and pulsating headaches lasting 4–72 hours, often accompanied by photosensitivity, phonosensitivity and/or pre-migraine auras. They are further classified as either episodic (<15 migraine days per month) or, less commonly, chronic (≥15 migraine days per month plus migraine features at least 8 days per month).² Successful migraine treatment is defined as a 50% reduction in the number of headache attacks within 3 months and a decrease in the duration of attacks, or as an improvement in symptoms following acute therapy.³

While medication plays a central role in migraine prevention and treatment, there is growing evidence that dietary intervention may also offer an effective approach to migraine management without the adverse effects associated with some medications. Consumption of certain food items may trigger a migraine attack, and these should be eliminated. The most frequently reported trigger foods include chocolate, cheese, alcohol, coffee and citrus.⁴ Broader dietary interventions may also reduce migraine frequency or prevent them altogether, particularly in individuals who cannot pinpoint singular triggers to eliminate. A recent randomised

crossover trial found that a low-fat plant-based diet reduced migraine pain, duration and need for pain relief medication.⁴ Previous studies have also investigated the potential benefits of elimination diets, low-fat diets, ketogenic diets and low glycaemic diets on migraine pain and frequency.

There are many possible mechanisms by which dietary interventions could impact migraine characteristics. Although the pathophysiology of migraines is not clearly elucidated, inflammation and oxidative stress are well-established contributing factors to the cortical spreading depression and trigeminovascular activation implicated in migraine aetiology.⁵ Dark green leafy vegetables are important sources of carotenoids, such as beta-carotene, which are phytonutrients proven to reduce systemic inflammation and oxidative stress.^{6,7} A whole food plant-based diet (WFPBD) rich in dark leafy greens, therefore, may provide a safe and effective treatment for migraine. In this study, we report the case of a patient with 12 years of migraine and 6 months of chronic migraine who achieved total migraine relief for 7.5 years, from June 2012 to January 2020, after conventional pharmacological therapies, elimination diets and stress reduction techniques were exhausted. He did so by adopting a dark green leafy vegetable-based diet, called the Low Inflammatory Foods Everyday (LIFE) diet. Two previous studies found that the LIFE diet significantly increases beta-carotene and significantly decreases systemic inflammation measured by high-sensitivity C-reactive protein (hsCRP).^{8,9} To our knowledge, this study reports the longest successful treatment of chronic migraine attained with only dietary intervention published to date.

CASE PRESENTATION

A 60-year-old man presented to an outpatient lifestyle medicine clinic for a 12.5-year history of severe migraine headaches without aura. During this period, he had approximately 4–6 headache attacks per month for a total of 12–18 headache days per month, which increased to 6–8 headache attacks per month (18–24 days per month) in the last 6 months. He described a prodrome of tightness in his shoulders and the back of his neck 15–30 min before the attacks. The pain started suddenly and intensely in the forehead and temple region on the left side of his head. The quality of pain was throbbing in nature, and it lasted for 72 hours. His headaches were accompanied by photosensitivity, phonophobia, nausea and vomiting. On a pain scale of 0–10, the headaches were a 10–12/10.



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To cite: Perzia BM, Dunaief JL, Dunaief DM. *BMJ Case Rep* 2021;**14**:e243987. doi:10.1136/bcr-2021-243987

Table 1 HIV treatment

Abacavir/lamivudine	600 mg/300 mg once daily
Nevirapine	400 mg daily

The patient's other medical problems include HIV infection, which is well-controlled with highly active antiretroviral therapy (HAART, [table 1](#)), hyperlipidaemia treated with rosuvastatin and seasonal allergies treated with albuterol. His family history is unknown since he was adopted. He is a former smoker (50 pack-year history prior to 1998) with no alcohol or illicit drug use.

Serum laboratory tests at presentation, including complete blood count (CBC), comprehensive metabolic panel (CMP) and hydration through blood urea nitrogen/creatinine (BUN/Cr) ratio were all within normal limits. Specifically, the patient had a low-normal hsCRP (0.3 mg/L), which indicated low levels of systemic inflammation, and a normal beta-carotene level (53 µg/dL; normal range 3–91 µg/dL). It is important to note that although the patient's beta-carotene was in the normal range on presentation, it was likely derived from his daily consumption of sweet potatoes instead of dark green leafy vegetables, which his initial diet lacked (see later). Sweet potatoes are starchy vegetables high in beta-carotene but relatively low in the phytonutrients responsible for the anti-inflammatory and antioxidant properties of carotenoids.

The patient's diet at presentation consisted of shredded wheat with soy milk or one slice of whole grain toast with peanut butter and four egg whites omelette for breakfast; peanut butter and banana sandwich on whole grain toast or tuna sandwich on whole grain toast for lunch; and chicken cutlet or fish with sweet potato, apple and water for dinner.

Differential diagnosis

The location, characteristics and duration of this patient's headache attacks were most consistent with migraine type headaches versus tension or cluster, which are associated with bilateral pain and lacrimation/ocular redness, respectively. Workup for secondary causes of chronic headache including tumour, trauma or sinusitis, which were completed by his outpatient neurologist, were negative. His HIV status was also taken into consideration as a possible aetiology because HIV is known to cause headaches of migraine pattern, tension type and cluster. Furthermore, antiviral medications may cause headache as a side effect.¹⁰ Finally, the patient's allergies were taken into account as a possible contributor to his headache symptoms and vice versa.¹¹ However, the patient's headaches did not fluctuate when his seasonal allergies flared in the spring or respond to therapies that alleviated his allergies.

Box 1 Therapies tried and failed before the life diet

Pharmacological

- ▶ Zolmitriptan (nasal) 5 mg.
- ▶ Topiramate 25 mg daily.

Dietary modifications

- ▶ Elimination diets (chocolate, cheese, nuts, caffeine, dried fruit).

Personality adjustment/stress reduction therapies

- ▶ Meditation.
- ▶ Yoga.

Treatment

Initial treatment of the patient's migraines included pharmacological therapies for 12 years, which were ineffective ([box 1](#)). He also trialled interventions aimed at personality adjustment and stress reduction given the well-documented connection between and migraine and personal stress sensitivity.¹² These techniques did not impact the severity or frequency of migraine in this patient. Finally, the patient made dietary adjustments by identifying triggers and trialling several elimination diets ([box 1](#)).

The patient was then counselled to adhere to the LIFE diet. Components of the LIFE diet include drinking one 32-ounce LIFE smoothie every day, consuming at least five ounces by weight of dark green leafy vegetables (DGLV) in salad or cooked vegetables per day, and limiting consumption of whole grains, starchy vegetables, oils, dairy and red meat. The specifics of this diet are thoroughly outlined in two prior LIFE diet studies.⁹

OUTCOME AND FOLLOW-UP

On the LIFE diet, the patient in this report dramatically increased his dark green leafy vegetable intake and reduced his consumption of animal protein. Adherence to the diet was measured subjectively by the patient's daily food diary and objectively by serum levels of beta-carotene, which is found primarily in dark green leafy vegetables. The patient was advised to continue his routine medications during the intervention. He did not alter his lifestyle or medications in any other way. On 2-month follow-up, the patient reported a dramatic reduction in the frequency of migraine attacks, from approximately 18–24 migraine days to 1 migraine day/month. Repeat labs remained the same except for a substantial rise in beta-carotene levels, from 53 µg/dL to 92 µg/dL in month 1. He also reported decreased duration and severity of migraine attacks. By 3 months follow-up, the patient's migraines were eliminated. In months 3–6 after implementing the LIFE diet, the patient challenged himself with certain foods. When he consumed egg whites, salmon or iced tea, atypical triggers, he experienced headache attacks, rated 4–5/10 in intensity and much shorter in duration if untreated, which completely resolved with Excedrin. After the 3 to 6-month period of challenging himself, he was migraine-free for 7 years, and he stopped all of his migraine medications after month 2 of LIFE diet initiation. Serum laboratory tests, including CD4 count and viral load, remained the same over this period except for his beta-carotene levels, which peaked at 175 µg/dL by 5 months and remained above 150 µg/dL for the following 7.5 years ([table 2](#)). Interestingly, after the patient started the LIFE diet and his migraine frequency diminished, he also achieved allergy relief and improved lipid levels, obviating the need for albuterol and rosuvastatin, respectively. Overall, the patient reports improved quality of life and functionality since he started the diet.

DISCUSSION

The patient in this case study completely eliminated his severe chronic migraine headaches and has not needed medication for 7.5 years following initiation of the LIFE diet. While it is well-established that diet may affect migraines, we believe it was worthwhile to report the remarkable reduction in headache frequency and severity achieved with the LIFE diet in this patient, who had 12.5 years of frequent, debilitating migraines. The patient tried to remove known migraine triggers from his diet such as chocolate and cheese, but this was without benefit. We also took the unusual step of documenting a high intake of beta-carotene-rich green leafy vegetables by measuring serial beta-carotene blood levels.

Table 2 Beta-carotene and C reactive protein (CRP) levels over 7 years on the Low Inflammatory Foods Everyday diet

Date	Beta-carotene (3–91)	CRP*
3 July 2012 (baseline)	53†	0.3
14 August 2012	92	
12 December 2012	170	0.2
19 June 2013	180	
28 August 2014	180	0.3
27 June 2019	188	0.9
3 September 2019	159	0.9
13 November 19	169	0.8

*CRP <1 is optimal.

†While this value is in the normal range for beta-carotene, it was likely due to the patient's large consumption of sweet potatoes rather than his dark green vegetable intake at baseline.

Previous cross-sectional studies have established that HIV infected patients are at increased risk for migraine headaches, and some studies suggest that CD4 count may be inversely related to migraine severity.¹³ It is certainly possible that the patient's HIV status and HAART contributed to his symptoms. However, it was not possible to study headache in this HIV patient without the interference of antiretroviral medications, which is a limitation of the study. Additionally, the patient maintained a stable CD4 count (>900 cells/mm³) and undetectable viral load with the same HAART throughout the entire course of his treatment, so it is unlikely that his HIV status impacted the dramatic change in his clinical course after initiation of the LIFE diet.

Similarly, current epidemiological data support a relationship between allergy and migraine, though the pathophysiology connecting these comorbidities remains unclear.¹¹ Prior clinical studies suggest that better control of allergies may lead to fewer headaches.¹¹ On the other hand, migraine is known to trigger autonomic nasal symptoms, implying that migraine control may improve rhinitis in patients with allergy as well.¹⁴ The present study further supports this hypothesis as migraine mitigation with the LIFE diet improved the patient's allergy symptoms to the point that he no longer required seasonal albuterol.

The only sustained change in the patient's labs after LIFE diet initiation was the dramatic rise in beta-carotene from baseline. Beta-carotene, which is abundant in the dark green leafy vegetable-based LIFE diet, is a retinol-precursor with antioxidant and anti-inflammatory properties.⁶ Importantly, beta-carotene supplements or beta-carotene derived from starchy vegetables do not possess the same properties as beta-carotene in dark green leafy vegetables. In fact, beta-carotene supplements have been associated with either no benefit or increased risk of lung cancer in smokers and cardiovascular events.^{15 16} Beta-carotene, therefore, is better understood as a marker for numerous other phytonutrients in dark green leafy greens. In this study, we know the patient's rise in beta-carotene was due to the LIFE diet because he was not taking supplements and he reduced his intake of starchy vegetables relative to dark leafy greens, resulting in a 200% rise in beta-carotene from baseline. Given the central role that a pro-inflammatory and oxidative state play in migraine pathophysiology, it is likely that this patient achieved relief and reversal from his chronic migraines by increasing his phytonutrient consumption in a WFPBD.

At baseline, the patient was already eating mostly a WFPBD with modest levels of carotenoids, but by increasing

the dark green leafy vegetable consumption, his carotenoids increased dramatically. It is also possible that switching from his regular diet to the LIFE diet removed a migraine trigger, however, he had tried elimination diets removing his regular foods to no avail, these included peanuts, nut butters, chocolate, caffeine, dried fruits and cheeses. He did discover after embracing the LIFE diet that he was sensitive to salmon, egg whites and iced tea. These triggered mild headaches, which presented much differently than the original migraines. They were 4–5/10 in severity, instead of 10/10, and lasted 8–12 hours if untreated, rather than 72 hours. He described them as pulsing above the right parietal lobe. There was no treatment window; two Excedrin would eliminate these headaches, rather than a triptan.

This report suggests that a whole food plant-based diet may offer a safe, effective and permanent treatment for reversing chronic migraine. While this report describes one very adherent patient who had a remarkable response, the LIFE diet has reduced migraine frequency within 3 months in several additional patients (DD, personal observation). Prospective studies on the effects of the LIFE diet and other WFPB diets on patients suffering from migraines are warranted.

Patient's perspective

I am a photographer, and migraines made my job almost impossible. Before I changed my diet, I was suffering six to eight debilitating migraines a month, each lasting up to 72 hours. Most days, I was either having a migraine or recovering from one. I was on preventive medication, topiramate, and I would take Zomig when I first felt symptoms. Still, if I missed the 15–30 min medication window, the migraines would be a 12 out of 10, and I could end up in bed in the fetal position. I was desperate. However, within 1 month of beginning a nutrient dense plant-based diet that included primarily lots of dark green leafy vegetables, fruits, beans, oatmeal, and a daily green smoothie, I was able to get off both medications. As soon as I stopped the topiramate, my energy increased. Now the migraine medications have expired, and I have not had a migraine in 7 years. I can't even remember the last time I had a headache. I am no longer a prisoner in my own body. I have my life back. As a bonus, my asthma improved dramatically since changing my diet, so I no longer take asthma medications. I also was able to get off my cholesterol medication.

Learning points

- ▶ Dark green leafy vegetables are important sources of carotenoids (ie, beta-carotene) that reduce systemic inflammation and oxidative stress, both of which are implicated in migraine aetiology.
- ▶ This patient with 12.5 years of migraine, which was refractory to all conventional therapies, achieved total migraine relief for 7.5 years following initiation of a nutrient-dense, dark green leafy vegetable-rich, whole food plant-based diet (Low Inflammatory Foods Everyday (LIFE) diet).
- ▶ The benefit of the LIFE diet is not from simply removing triggers, which this patient tried previously.
- ▶ A whole food plant-based diet may offer a safe, effective and permanent treatment for reversing chronic migraines, particularly in those with refractory disease.

Acknowledgements This research was supported by the Adele Niessen Endowed Chair (JD).

Contributors BMP wrote the manuscript and was involved in editing. JD helped with writing and editing. DD provided the patient data and helped with editing and writing.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Consent obtained directly from patient(s).

Provenance and peer review Not commissioned; externally peer reviewed.

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