

CLINICAL VIGNETTE

Plant-Based Diet as Monotherapy for Dyslipidemia

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Case Presentation

A 50-year-old African-American male presents for his annual wellness visit. He is in good health and has never smoked. He has well-controlled psoriasis. His family history is notable for hyperlipidemia in his father, mother, and sister. Screening lipid panel revealed total cholesterol of 350 mg/dL, and elevated LDL of 269 mg/d. His American College of Cardiology (ACC) 10-year atherosclerotic cardiovascular disease (ASCVD) risk score could not be calculated total and LDL cholesterol values above the reference range for use. He was prescribed atorvastatin 40 mg daily due to concern for familial hypercholesterolemia. A lipid panel obtained 6 months after atorvastatin initiation showed a LDL decrease to 161 mg/dL. This decrease did not meet the 2018 ACC target reduction by 50% for primary severe hypercholesterolemia.¹ The atorvastatin dose was increased to 80 mg daily with subsequent LDL level 6 months later decreasing to 111 mg/dL, meeting the target goal of 50% reduction in LDL level. His calculated ACC 10-year ASCVD risk was 3.4 % on statin therapy and he was tolerating the medication.

At his wellness visit 8 months later, he had stopped atorvastatin 3 months prior to his visit and had been following a plant-based diet with occasional fish for 2.5 months. Repeat LDL at this visit showed LDL of 120 mg/dL off statin with a calculated ACC 10 year risk of 3.7% well below the threshold for medication treatment.

Discussion

Cardiovascular disease remains the leading cause of death in United States, killing one person every 37 seconds,² and costing more than \$2 billion dollars annually. While these numbers of affected individuals continue to grow, the clinical guidelines for management of hyperlipidemia, a primary risk factor for coronary artery disease, have largely remained the same and include “lifestyle modification”. In addition, guidelines address the role of pharmacotherapy including statin (HMG-CoA reductase inhibitor) medications, ezetimibe, and proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitors, such as evolocumab and alirocumab.³

About 25% of the world population greater than the age of 65 years-old takes a statin medication long-term for primary and secondary prevention of cardiovascular disease.⁴ The rate of drug-drug interactions and adverse reactions are high. These include statin-associated myopathy and hepatotoxicity. Non-

adherence to statins and other hyperlipidemia treatments is therefore very common.⁵ Despite being the first line of recommended therapy for established cardiovascular disease, dietary modifications remain under-utilized in individuals without established cardiovascular disease, in large part because of the lack of specific guidance. To this day, what constitutes the ideal diet for the average patient with hyperlipidemia continues to be controversial.

The American Heart Association and the American College of Cardiology’s recommendations for the general public as well as those with atherosclerotic cardiovascular disease have focused on limiting saturated and trans fats, which can be found in animal products. In recent years, many studies have shown the lipid lowering effects of consuming a plant-based diet, where sources of fats and protein from animals are replaced with plants. A plant-based diet is not synonymous to a vegetarian diet where benefits from high and low quality plant sources are not differentiated. A graded approach has been advocated by Satija et al, also known as “healthy plant-based diet index” (hPBDi), which emphasizes high-quality plant foods including whole grains, whole fruits, vegetables, nuts, legumes, vegetable oils, tea and coffee. At the same time, hPBDi limits low-quality plant foods like fruit juices, refined grains, potatoes, sugar-sweetened beverages and desserts. While hPBDi contains low amounts of all foods from animal sources, one should institute animal product reduction gradually acknowledging cultural or traditional needs.⁶

High adherence to hPBDi has shown to be inversely and independently associated with coronary heart disease.⁶ A recent study done at Johns Hopkins also showed that a 10-unit increase in hPBDi to be associated with 5% decrease in all-cause mortality in women.⁷ The mechanism of lipid lowering effect is likely multifactorial. A meta-analysis of randomized controlled trials by Li *et al.* showed substitution of plant protein for animal protein lowered low-density lipoprotein ($p < 0.00001$) as well as non-high-density lipoprotein cholesterol ($p < 0.00001$).⁸ Plant-based diets are rich in soluble fibers, which decrease LDL cholesterol and alter cholesterol synthesis. These soluble fibers also increase the synthesis and decrease the absorption of bile acids.⁹ Plant-based foods also limit the amount of gut inflammation by minimizing production of trimethylamine N-oxide (TMAO), a by-product derived from animal foods such as red meat, poultry, and fish. TMAO has been associated with

increased risks of major adverse cardiovascular events (MACE) and all-cause mortality independent of traditional risk factors.¹⁰

Following a hPBDi by replacing most if not all animal products in the traditional healthy diet has been shown to significantly reduce cardiovascular risk as well as all-cause mortality. This case presents an example of how transition to a plant-based diet can successfully improve one's lipid profile and ultimately eliminate a primary risk factor for cardiovascular disease. Lifestyle modification, while it is imperative in all patients with hyperlipidemia, can be extremely challenging, which is why clinicians should continue to educate and encourage patients to eliminate unhealthy foods using a step-by-step rather than all at once.

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