www.ijdrp.org
Vol. 2, No. 1. 2020

An Exclusively Whole-Plant-Food Diet in the Improvement of Fuchs' Endothelial Corneal Dystrophy

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Abstract

Fuchs' endothelial corneal dystrophy (FECD) is a progressive disorder of the corneal endothelium characterized by endothelial cell functional abnormalities and loss of visual acuity. Chronic oxidative stress plays a key role in disease progression. We present the case of a 69-year-old woman with an 18-year history of FECD that improved after dietary intervention with an exclusively whole-plant-food diet free of added salt, oil, and sugar. An eye exam 1 month prior to dietary intervention indicated that her uncorrected visual acuity was 20/50 -1 OD and 20/100 OS. The exam also showed 3+ guttae OD and 4+ guttae OS and intraocular pressures of 23 OD and 16 OS by applanation. After approximately 30 days on an exclusively whole-plant-food diet, the patient reported improved vision. An eye exam indicated that her visual acuity was 20/40 without correction with only trace stromal thickening and no edema in both eyes. Intraocular pressures were 17 OD and 15 OS by applanation. This case suggests an exclusively whole-plant-food diet may be beneficial in the treatment of FECD.

KEYWORDS: Fuchs' endothelial corneal dystrophy; Whole-plant-food diet

www.ijdrp.org/article/view/127/5
doi: 10.22230/ijdrp.2020v2n1a127

ISSN: 2638-2091

International Journal of
Disease Reversal
and Prevention

Introduction

Fuchs' endothelial corneal dystrophy (FECD) is a progressive disorder of the corneal endothelium characterized by endothelial cell functional abnormalities, morphological changes including guttae, corneal edema and opacity, and loss of visual acuity.[1] The exact incidence of FECD is unknown, but the incidence of corneal guttae increases

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Funding

No external funding was provided for this article.

Patient Consent

The patient has consented to the publication of this report.

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

Potential Conflicts of Interest

None

with age and are seen in 4-10% of patients over the age of 40 in the United States.[1] Fuchs' endothelial corneal dystrophy predominately affects women and more aggressive variants of the disorder are rare.[2,3,4]

Although the exact etiology of FECD is unclear and sporadic cases are common, familial clustering suggests an autosomal dominant mutation with incomplete penetrance as a possible mode of inheritance.[3,5] A number of antioxidant genes are down-regulated in FECD, including metallothionein 3, superoxide dismutase 2 and 3, and peroxiredoxin 2, 5, and 6.[6] Several other mutations have also been identified.[6,7] Chronic oxidative stress—characterized by decreased antioxidant defense and increased oxidative DNA damage and apoptosis of corneal endothelial cells—plays a key role in disease progression.[8]

Conservative treatment options focus on reducing corneal edema, including topical hyperosmotic and oral agents that lower intraocular pressure.[9] Surgical treatment options for FECD include Descemet membrane endothelial keratoplasty (DMEK), Descemet stripping endothelial keratoplasty (DSEK), and penetrating keratoplasty, which are cornea transplantation procedures using donor corneas.[1,2] Fuchs' endothelial corneal dystrophy diagnosis accounts for approximately 15-20% of patients receiving corneal transplantation in the United States and Germany.[2,3,4] Novel therapies are currently under study.[10,11] We could not find any literature investigating the effect of diet or nutrition in the non-surgical treatment or management of FECD.

Case Report

In October 1999, the 51-year-old, female patient was diagnosed with Fuchs' endothelial corneal dystrophy (FECD) by a board-certified ophthalmologist. The diagnosis was based on increased corneal thickness with optical slit lamp central pachymetry measurements of OD 589 µm and OS 621 µm, and significant guttae in both eyes. Her best-corrected visual acuity was 20/25 -1 OD and 20/30 -2 OS (Table 1). She was prescribed Muro 128 eye drops to reduce swelling, which she had continued using without improvement and with increasing irritation.

Table 1. Visual Acuity, Pachymetry, Intraocular Pressure, and Exam Notes

	10/1999	3/2010	5/2017	8/2017	11/2017
VA, uncorrected					
OD	20/30	20/200	20/50 -1	20/40 -2	20/40 -1
OS	20/30 -2	20/50	20/100	20/40 -1	20/40 -1
VA, corrected					
OD	20/25 -1	20/100	ND	20/40	ND
OS	20/30 -2	20/50	ND	20/30 -2	ND
Pachymetry (µm)					
OD	589	689	ND	ND	ND
OS	621	665	ND	ND	ND
IOP					
OD	9	ND	23	17	11
OS	12	ND	16	15	10
Guttae					
OD	guttae	3+ guttae	3+ guttae	guttae	1+ guttae
OS	guttae	3+ guttae	4+ guttae	guttae	1+ guttae
Edema					
OD	Present	Present	Present	None	None
OS	Present	Present	Present	None	None

Abbreviations: IOP, intraocular pressure by applanation; ND, no data; OD, oculus dextrus (right eye); OS, oculus sinister (left eye); VA, visual acuity

Over 10 years later, in January 2010, the patient reported waking up "in total white blindness" as if "someone put a table napkin over my eyes." She described having brief periods of sight that became progressively shorter until she was unable to read or cook for herself, walk without falling, or identify people in social situations. In March 2010, the patient presented to her ophthalmologist complaining of severe visual impairment and intermittent pain in both eyes. Her vision was 20/200 OD which improved to 20/100 with correction and 20/50 OS. An eye exam was significant for microcytic corneal edema and 3+ guttae. Optical slit lamp central pachymetry measurements were recorded at 689 µm OD and 665 µm OS. The patient's ophthalmologist confirmed significant FECD in both eyes and recommended corneal transplantation. However, corneal transplantation was not performed due to associated risks and lack of insurance coverage. In May 2017, the patient's uncorrected visual acuity was 20/50 -1 OD and 20/100 OS. The exam showed 3+ guttae OD and 4+ guttae OS. Intraocular pressures were 23 OD and 16 OS by applanation. Best-corrected visual acuity and central pachymetry were not recorded in the medical record for unknown reason (Table 1).

In June 2017, the patient presented to our health center with decreased visual acuity, ocular pruritus and dryness, photophobia, and mild cataracts. The patient's medical history included obesity and hypertension. On arrival, she weighed 124.9 kg with a body mass index (BMI) of 46.5 kg/m^2 and blood pressure of 143/83 mmHg. She had never smoked tobacco or used illicit drugs and did not drink alcohol. Family history was negative for FECD or other eye disorders. She endorsed eating a standard American diet throughout her life up until 10 days prior to arrival at our clinic when she had begun a whole-plant-food diet.

On arrival, she implemented an exclusively whole-plant-food diet free from added salt, oil, and sugar, which consisted of ad libitum raw fruits and vegetables, steamed and baked vegetables, whole grains, and legumes. A small amount of raw, unsalted nuts and seeds were included. All animal products, added sugar, oil and salt, and other highly processed foods were excluded.[12] On 26 June 2017, 15 days after arrival, the patient reported improvement in her vision with associated decreased ocular pruritus and pain. On 8 August 2017, the patient's ophthalmologist examined her and reported that visual acuity was 20/40 without correction in each eye. Intraocular pressures were 17 OD and 15 OS by applanation. The exam was significant for trace stromal thickening and no edema in both eyes. The patient stated her eyes were "doing so much better." In November 2017, after approximately 4 months of strict adherence to the implemented diet, the patient had another eye exam and her visual acuity was 20/40 without correction in each eye. Best-corrected visual acuity and corneal pachymetry were not recorded in the medical record for unknown reason. Intraocular pressures were 11 OD and 10 OS by applanation and slit-lamp examination was significant for +1 guttae and no edema in each eye. Her weight, BMI, and blood pressure had reduced to 92.7 kg, 35.2 kg/m^2, and 114/63 mm/Hg, respectively.

Discussion

We have presented the case of a 69-year-old woman with an 18-year history of FECD that showed clinically significant improvement after approximately 30 days on an exclusively whole-plant-food diet free of added salt, oil, and sugar. The mechanism by which diet may affect FECD pathophysiology is unknown. However, oxidative stress has been identified as a key factor in FECD pathogenesis,[8] and there is substantial evidence that plant-based diets, which are high in antioxidants, vitamins, minerals, and fiber, are able to reduce oxidative stress and enhance antioxidant defense.[13]

Conclusion

Overall, this case demonstrates that an exclusively whole-plant-food diet may be beneficial in the management of FECD. The case also provides a basis for further research to determine if this dietary intervention can significantly improve symptoms in patients with FECD and decrease the need for keratoplasty.

Acknowledgements

We would like to thank Faye Alexandrakis, DC and Zrinka Glavas, MS for data acquisition and Robert Daly, MD and Patricia Kolbe, MA for useful comments.

Abbreviations

BMI, body mass index
FECD, Fuchs' endothelial corneal dystrophy
OD, oculus dextrus
OS, oculus sinister

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