Can Vision Loss Be Predicted by a Mathematical Model of Fuchs Dystrophy?

We read with great interest the paper by Hatou et al.,1 and we congratulate the authors for collecting and analyzing data from such a large series of endothelial photographs.

The title of this article, “Mathematical Projection Model of Visual Loss Due to Fuchs Corneal Dystrophy,” suggests that loss of vision from Fuchs dystrophy can be predicted by this mathematical model, but in fact, it appears that the primary use of the model is to classify the condition of the cornea by using endothelial cell density and age. The authors did not report vision data or relate the classification based on the model to a prognosis for vision, and it is not clear how a clinician might use this model in practice. A classifier can tell us the stage of the disease, and from this we can infer a prognosis of vision, whereas a predictor will tell us how we can expect the disease to progress on the basis of current measurements. Can this model be used to predict loss of vision in Fuchs dystrophy, and do the authors have data on vision loss that they can share?

In addition, the model is based on endothelial photographs, which typically assess only a small fraction of the total endothelial area. In Fuchs dystrophy, estimates of endothelial cell density can vary widely across the cornea, especially if cells are not visible because of guttae. Can the authors comment on how many endothelial photographs should be taken to determine cell density and whether the limited sample area affects the classification and the prognosis predicted by the classification model? Should the estimate of cell density be based on samples with a minimum area or a minimum number of endothelial cells to assure a reliable estimate of cell density?

Little is known about the rate of progression of Fuchs dystrophy in individual patients or the ideal method of measuring this rate, but such a method would be very helpful in managing this disease and counseling patients. The authors should be commended for developing a model that may be helpful for assessing the progression of Fuchs dystrophy.

Jay W. McLaren
Sanjay V. Patel

References


Author Response: Can Vision Loss Be Predicted by a Mathematical Model of Fuchs Dystrophy?

We thank Drs. McLaren and Patel for their comments on our paper.1 As they pointed out, we did not report data concerning visual acuity. One of the objectives of our study was to devise a simple calculation model that can predict the possibility of visual disturbance due to the corneal edema caused by progressive endothelial cell loss. The title was meant to convey the possibility of predicting the prognosis relating to vision, and hence we used the word “visual” as an adjective meaning “relating to vision.” Our model cannot predict visual acuity.

Endothelial cell density was measured only at the center of the cornea for the sake of simplicity in devising this model. We agree that a single image of the central cornea does not represent the entire picture of what is happening in a particular patient with Fuchs dystrophy. However, again we wish to emphasize that the objective of our study was simplicity, and using a single specular image was part of the protocol.

Measurement of endothelial cell density was possible in most of the cases, even in those with guttae. Additional photographs were required in only a few cases in which visibility of endothelial cells was poor. Because of the large number of cases, a single photograph of the central cornea was sufficient for our purposes and was thought to affect neither the classification nor the results predicted by the model.

Shigeto Shimmura
Shin Hatou

Department of Ophthalmology, Keio University School of Medicine, Tokyo, Japan.
E-mail: shige@z8.keio.jp

References