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Validating the usefulness of the 'Random Forests' classifier to diagnose early glaucoma with optical coherence tomography

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Abstract

Purpose: To validate the usefulness of the 'Random Forests' classifier to diagnose early glaucoma with spectral domain optical coherence tomography (SD-OCT).

Method

Design: Comparison of diagnostic algorithms

Setting: multiple institutional practice

Study participants: Training dataset included 94 eyes of 94 open angle glaucoma (OAG) patients and 84 eyes of 84 normal subjects and testing dataset included 114 eyes of 114 OAG patients and 82 eyes of 82 normal subjects. In both groups, OAG eyes with mean deviation (MD) values better than -5.0 dB were included.

Observation Procedure: Using the training dataset, classifiers were built to discriminate between glaucoma and normal eyes using 84 OCT measurements using Random Forests method, multiple logistic regression models based on backward or bidirectional stepwise model selection, a least absolute shrinkage and selection operator regression (LASSO) model, and a Ridge regression model.

Main Outcome Measures: diagnostic accuracy

Result: With the testing data, the area under the receiver operating characteristic curve (AROC) with the Random Forests method (93.0 %) was significantly ($p < 0.05$) larger than those with other models of the stepwise model selections (71.9 %), LASSO model (89.6 %) and Ridge model (89.2 %).

Conclusion: It is useful to analyze multiple SD-OCT parameters concurrently using the Random Forests method to diagnose glaucoma in early stage.

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