A Predictive Model for Iris Melanoma

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Aim: To develop a predictive model for the diagnosis of iris melanoma.

Introduction: The current studies have been descriptive, wherein features of iris melanoma, sometime lacking pathologic confirmation and comparative group of iris nevi to elicit differentiating features lacking. A reverse analytic approach of **predictive analysis**, wherein clinical features that predict likelihood an iris melanocytic tumor of being iris melanoma, would be of greater clinical relevance.

Methods: Using a unique study design and stringent diagnostic criteria that included only pathologically confirmed cases of iris melanoma (100) and comparative population of iris nevi (112) that had documented stability (photographic +/- ancillary imaging studies) of at least 1 year **(Figure 1)** we developed and internally validated a prediction model using penalized lasso regression to select the subset of clinical features **(Figure 2)** that best distinguish iris melanoma from nevus. Iris melanoma with ciliary body extension were excluded. Discrimination was assessed with the AUC and calibration by a plot.

Results: Both nevi and melanoma had preference for inferior iris quadrants (83, 74%) and (79, 79%), respectively (p=0.50) **(Figure 3)** . Tumor seeding, glaucoma, and hyphema were present only in melanoma. The features that favored the diagnosis of melanoma were size (increased height [OR 3.35]; increased largest basal diameter [OR 1.64]), pupillary distortion (ectropion uvea or corectopia [OR 2.55]), peripheral extension (angle or iris root involvement [OR 2.83]), secondary effects (pigment dispersion [OR 1.12]), and vascularity [OR 6.79]. The optimism-corrected AUC was 0.865. The calibration plot indicated good calibration with most of the points falling near the identity line and the confidence band containing the identity line.

Conclusions: The predictive model provides direct diagnostic prediction of the lesion being iris melanoma expressed as probability (%) **(Figure 4)**. Use of a prediction calculator (app) can enhance decision making and patient counseling. Further refinements can be undertaken with additional datasets, forming the basis for automated diagnosis.
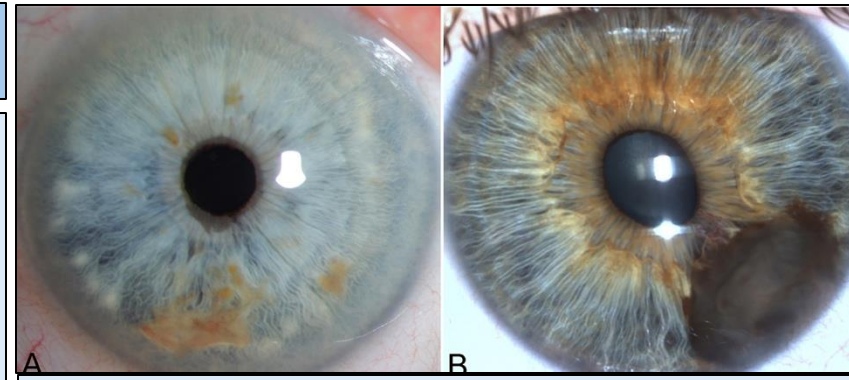

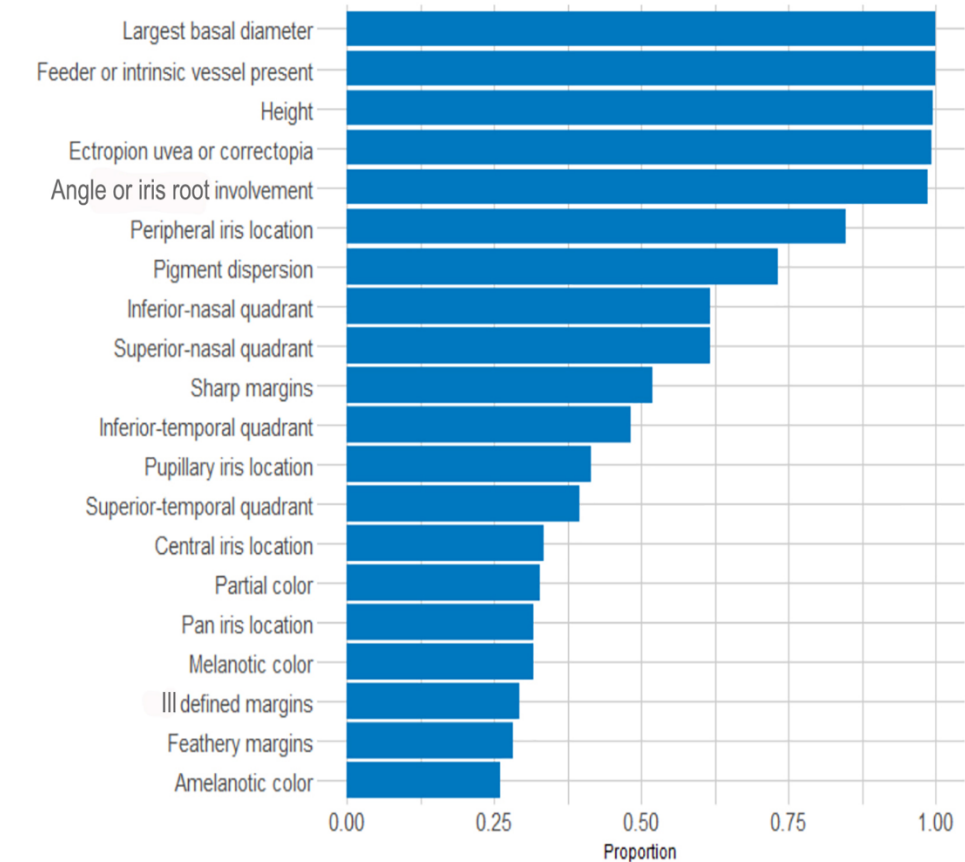**Figure 1**. Iris nevus (A) and iris melanoma (B)confirmed by excisional biopsy

Figure 2. Most frequent non-zero variables across the bootstrap samples.

Figure 3. Iris tumor location heat map of nevi (A) and melanomas (B). Dark red indicates area with highest overlapping tumors
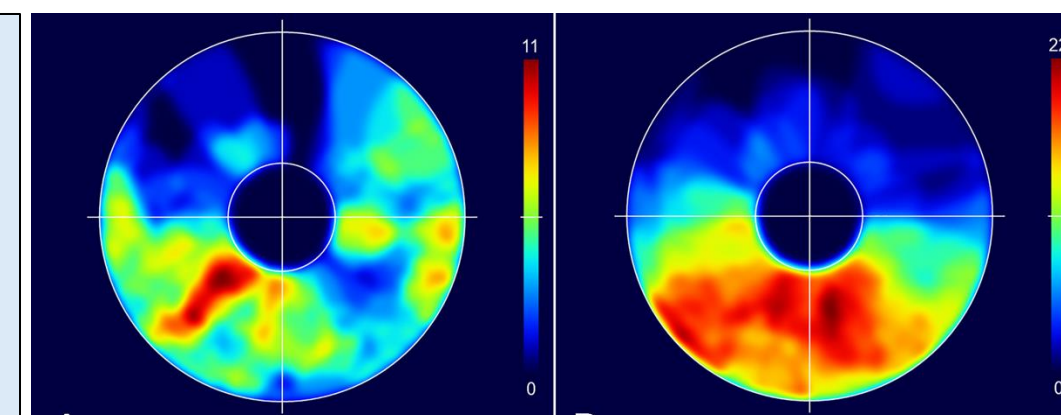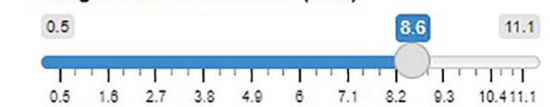
Figure 4. The highest predicted value is 99.8% for an iris melanocytic tumor (LBD 8.6 mm, height 1.5 mm) located in the inferior-temporal quadrant with pan iris location and angle involvement, and presence of pupillary distortion (ectropion uvea, corectopia), and intrinsic vessels. Tumor seeding, glaucoma, and hyphema were represented perfect prediction for melanoma.

Iris Melanoma Predictor

The predicted probability of melanoma is 99.8%.