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Anterior segment optical coherence tomography of limbal palisade structure predicts corneal and limbal epithelial status in diabetic patients

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Abstract

Purpose : Purpose: To examine corneal and limbal epithelial changes in diabetic (DM) patients compared to normal subjects with anterior segment optical coherence tomography (asOCT) and in vivo confocal microscopy (IVCM).

Methods : Methods: 286 eyes of 146 diabetic patients and 370 eyes of 197 normal subjects were examined in a retrospective case control study. Groups were strictly age and gender matched. Limbal and central epithelial thickness (LET and CET) were measured with asOCT. Limbal palisades of Vogt (PoV) structure was assessed on en face asOCT images, and graded 0-3 based on visibility of typical palisades. Corneal subbasal nerves were examined with IVCM and corneal nerve fiber length (CNFL) and density (CNFD) were calculated. Patients' degree of retinopathy (DRSS), presence of diabetic macular edema and latest HbA1c and GFR values were registered. Parameters were compared using independent sample t-test, χ^2 test and Kaplan-Meier statistics. Spearman correlation and multiple logistic regression were used to select strongest predictors.

Results : Results: Absence of PoV structure was more frequent in diabetics less than 60y old ($p < 0.05$). CNFL (10.6 ± 3.25 vs. 8.4 ± 3.5 mm/mm², $p < 0.01$) and CNFD (12.4 ± 5.8 vs. 8.9 ± 5.6 /mm², $p < 0.01$) were significantly lower in diabetic patients. LET was thicker in DM (139.6 ± 38.9 μ m vs 128.9 ± 39.1 μ m, $p = 0.04$). Patients with diabetic retinopathy had similar but more pronounced changes in LET ($p < 0.01$) and a reduced CET (52.3 ± 4.02 μ m vs 53.7 ± 3.9 μ m $p = 0.03$) compared to normal controls. Kaplan-Meier plots showed that LET and CET decreased significantly faster with age in the diabetic than in the normal group ($p < 0.01$). In diabetic patients, LET and CET correlated with PoV structure ($r = 0.398$ and 0.272 respectively, $p < 0.01$) and the degree of retinopathy ($r = 0.297$ and 0.191 , respectively, $p = 0.02$). The degree of retinopathy and PoV structure were the only necessary predictors for LET; and PoV structure and HbA1c for CET.

Conclusions : Conclusion: In DM, morphological changes similar to ageing occur in limbal and corneal epithelium. Our results show that limbal health is influenced mainly by DM-related metabolic changes and is not influenced by the integrity of the sub-basal nerve plexus. Observation of PoV structures can help estimate corneal epithelial health and regenerative capacity in patients with diabetes.

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