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Low Luminance Visual Acuity is Better Related to Macular OCTA Parameters than Standard BCVA in Diabetic Macular Edema

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Purpose:
To evaluate the relationship between low luminance visual acuity (LLVA) and low luminance deficit (LLD) versus macular capillary flow parameters in patients with diabetic macular edema (DME).

Methods:
Thirty-six diabetic patients (36 eyes) with early treatment-naïve center-involving DME were evaluated. Each patient underwent: best corrected visual acuity (BCVA), LLVA and LLD determination; optical coherence tomography (OCT) and OCT angiography (OCTA). The following OCTA quantitative parameters were calculated in superficial (SCP), intermediate (ICP) and deep retinal capillary plexuses (DCP): Vascular Area Density (VAD), Vascular Length Fraction (VLF), Vascular Diameter Index (VDI) and Fractal Dimension (FD). The foveal avascular zone (FAZ) was measured in an en face projection including all retinal plexuses.

Results:
Mean BCVA, LLVA and LLD were 80.9 ± 4.9, 64.7 ± 12 and 16.2 ± 9.3 letters, respectively. LLD was (pathologically) increased by two-fold compared to the normal range. Central retinal thickness (CRT) was 315.0 ± 58 mm. Mean FAZ area was 330.0 ± 152 mm². BCVA was not correlated to the FAZ area as to VAD, VLF and FD of the superficial capillary plexus, and not significantly correlated to OCTA parameters of both ICP and DCP (p>0.05, for each one, respectively). LLVA and LLD were highly significantly correlated to the FAZ area (p<0.002 for both). They were also significantly correlated to all OCTA parameters of ICP and SCP (p<0.001, for each one), as DCP (p<0.002, for each one). CRT was not correlated to any OCTA parameter or visual function test.

Conclusions:
A poor relationship exists between CRT and: BCVA, LLVA and OCTA parameters in DME eyes. The major macular blood flow parameters in diabetic macular edema are better and more homogeneously correlated to LLVA and LLD than standard BCVA. Therefore, LLVA and LLD better reflect the visual function impairment determined by even initial DME on retinal neurovascular unit. Moreover, LLD change underlines that the retinal pre-receptor pathway is early involved in patients with DME and normal BCVA, mirroring the beginning of irreversible retinal function damage in these eyes. This observation points to the importance of quantifying low luminance visual acuity and low luminance deficit when planning follow-up and treatment of DME.