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Longitudinal changes of microvascular perfusion and neurodegeneration in early type 2 diabetic retinal disease

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Purpose:
To prospectively follow subclinical changes in capillary perfusion and retinal layer thickness in patients with type 2 diabetes and early retinal disease over 2 years.

Methods:
In this longitudinal study we performed biannual imaging with RTVue optical coherence tomography (OCT)-angiography to analyze foveal avascular zone (FAZ) area, perimeter, acircularity index (AI), and parafoveal superficial/deep vessel density (VD). Spectralis OCT was used to measure the thickness of 9 macula layers and the peripapillary nerve fiber layer.

Results:
We included 105 eyes (54 left) of 53 diabetic patients with no diabetic retinopathy (DR) at baseline. We found progression to mild non-proliferative DR in 10 eyes at year 2. FAZ area (estimate ± SE: +0.008 ± 0.002 mm²/year, p<0.0001), perimeter (+0.040 ± 0.011 mm/year, p=0.0003), and AI (+0.006 ± 0.002/year, p=0.0036) increased over the course of 2 years. A pronounced decrease was found in the superficial (-1.52 ± 0.313 %/year, p<0.0001) and in the deep VD (-0.48±0.22 %/year, p = 0.033). Inner neuroretinal loss was confined to the ganglion cell (-0.588 ± 0.154 µm/year, p=0.0002) and inner plexiform layer (-0.401 ± 0.128 µm/year, p=0.0018). In the outer retina, we observed a statistically significant thickness-decrease in outer plexiform, photoreceptor layer and pigment epithelium of -0.973 ± 0.165 µm/year, -0.410 ± 0.147 µm/year, and -0.397 ± 0.091 µm/year, respectively.

Conclusions:
This study illustrates the longitudinal change of potential OCT and OCTA biomarkers in patients with type 2 diabetes over a 2-year observational period. Subclinical signs of microangiopathy and neurodegeneration appear in parallel and are highly progressive even in the earliest stages of diabetic retinal disease.