Ophthalmology Times

Research Scholar Honoree Program

Early visual functions deficiency and OCT-A changes at the preclinical stage of diabetic retinopathy: a prospective study

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FINANCIAL DISCLOSURES:

No financial disclosures

MY ROLE IN THIS RESEARCH:

Please answer which of the following portions of the research you participated in:

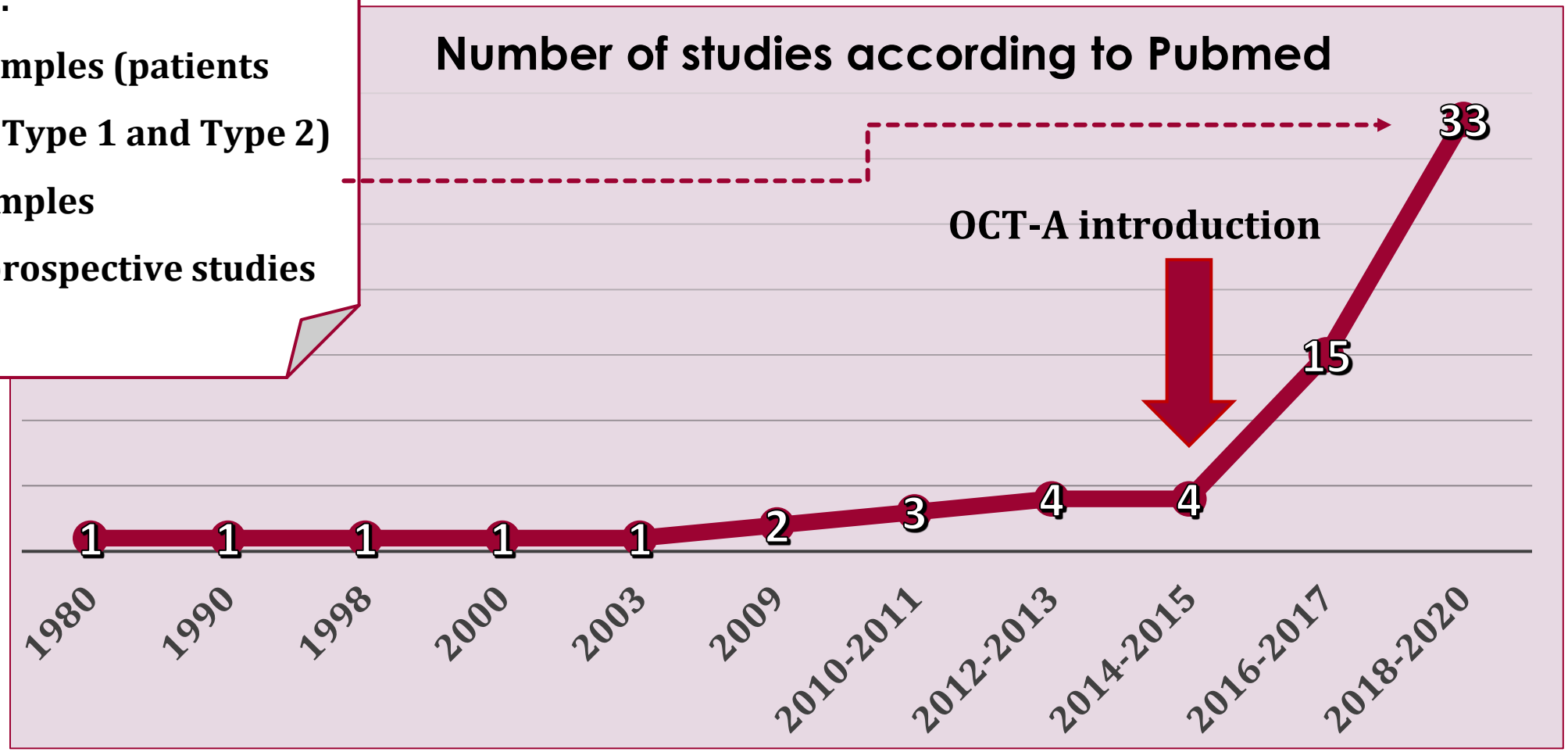
- ✓Conception and design of the work/project
- ✓Acquisition of data
- ✓Analysis and interpretation of data
- ✓Creation and/or critical review of the presentation

Background

Limitations:

- **Mixed samples (patients with DM Type 1 and Type 2)**
- **Small samples**
- **Lack of prospective studies**

Preclinical diabetic retinopathy



Objective and Methods

Objective:

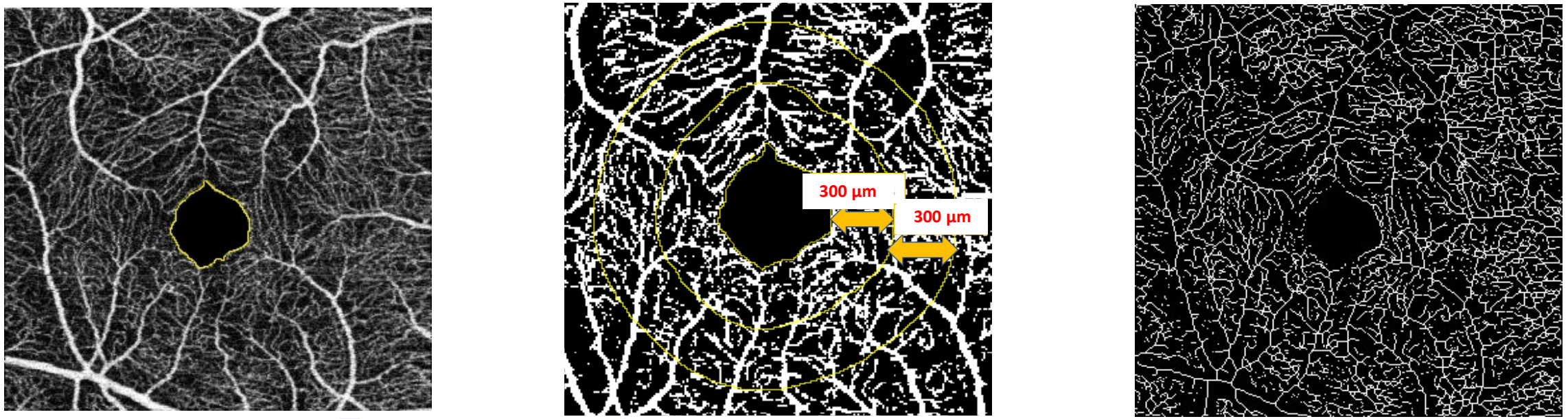
To investigate visual functions and OCT-A changes in patients with type 1 diabetes mellitus (T1DM) with no clinical signs of diabetic retinopathy

Methods:

- A prospective clinical study was started in September 2019
- Two groups: DM (39 patients, 73 eyes) and controls (30 healthy age-matched volunteers, 43 eyes)
- Inclusion criteria for DM group: T1DM, no clinical signs of DR, age - 18-45 years
- Examinations: standard ophthalmological examination, low-luminance visual acuity (LLVA) assessment, 7-field fundus photography, OCT and OCT-A.

Methods: OCT-A analysis

OCT-A scans of three plexuses (SVP, ICP, DCP) were processed in ImageJ



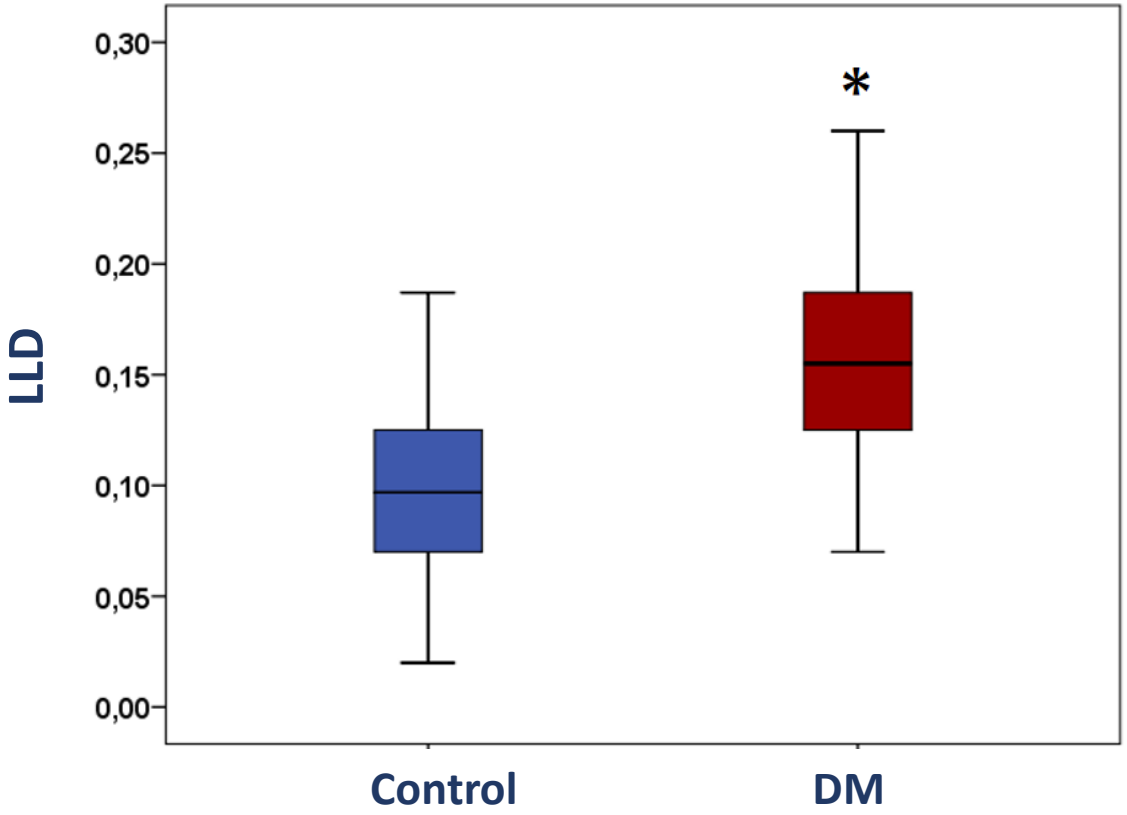
FAZ parameters:

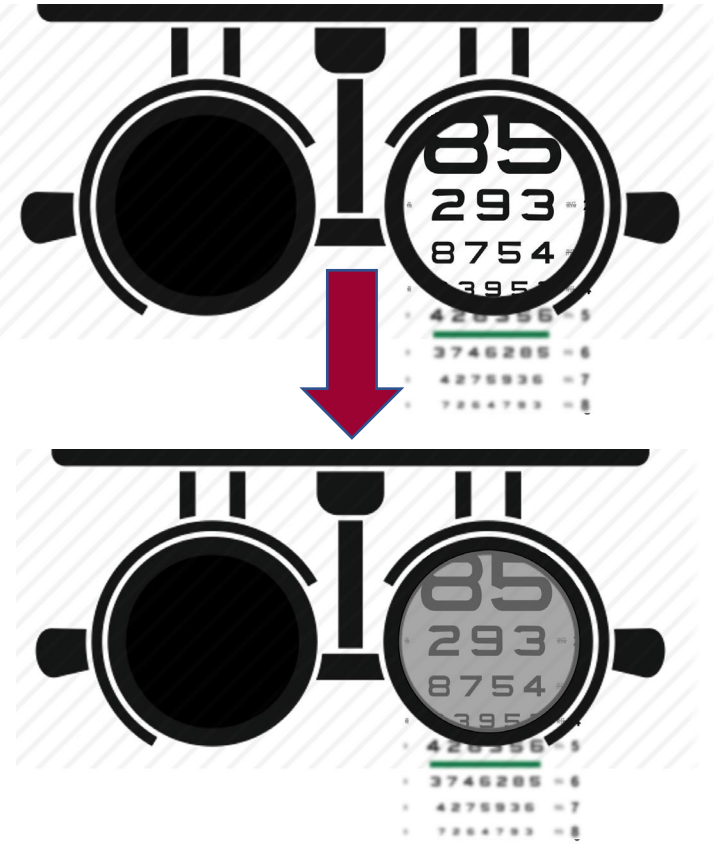
- Foveal avascular zone (FAZ) area (mm2)
- Acircularity index

Vessel density parameters:

- VD in 300-µm and 600-µm wide area (VD 0-300 and VD 300-600)
- Skeletonized density (SD)
- Vessel diameter index (VDI)

Results: LLVA assessment

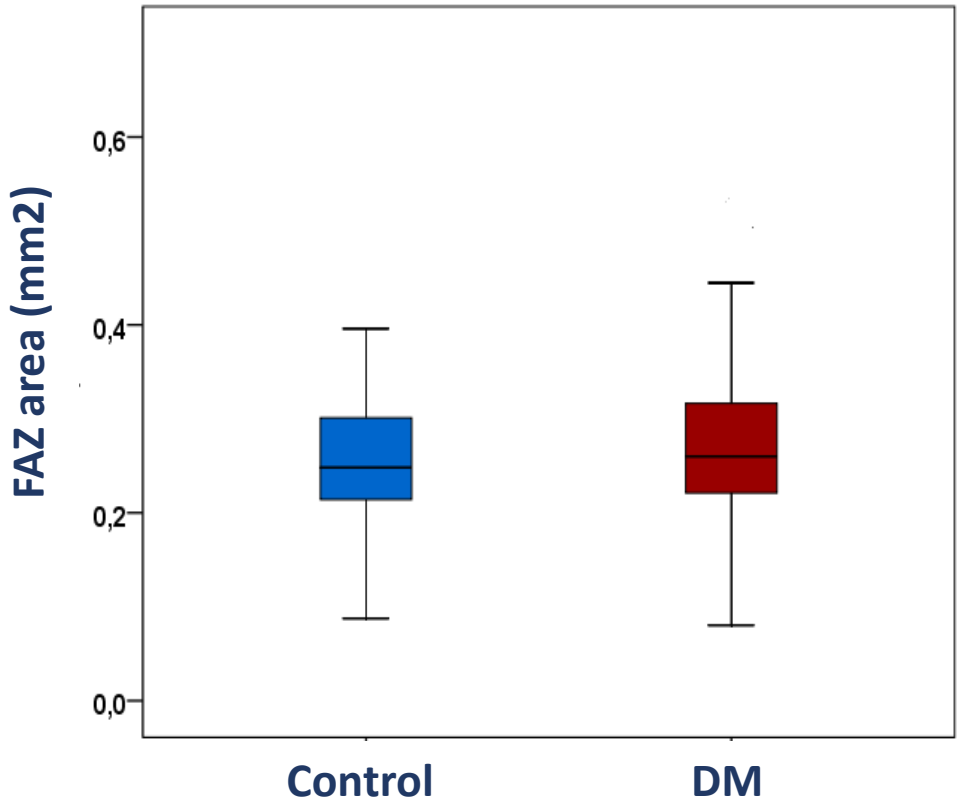


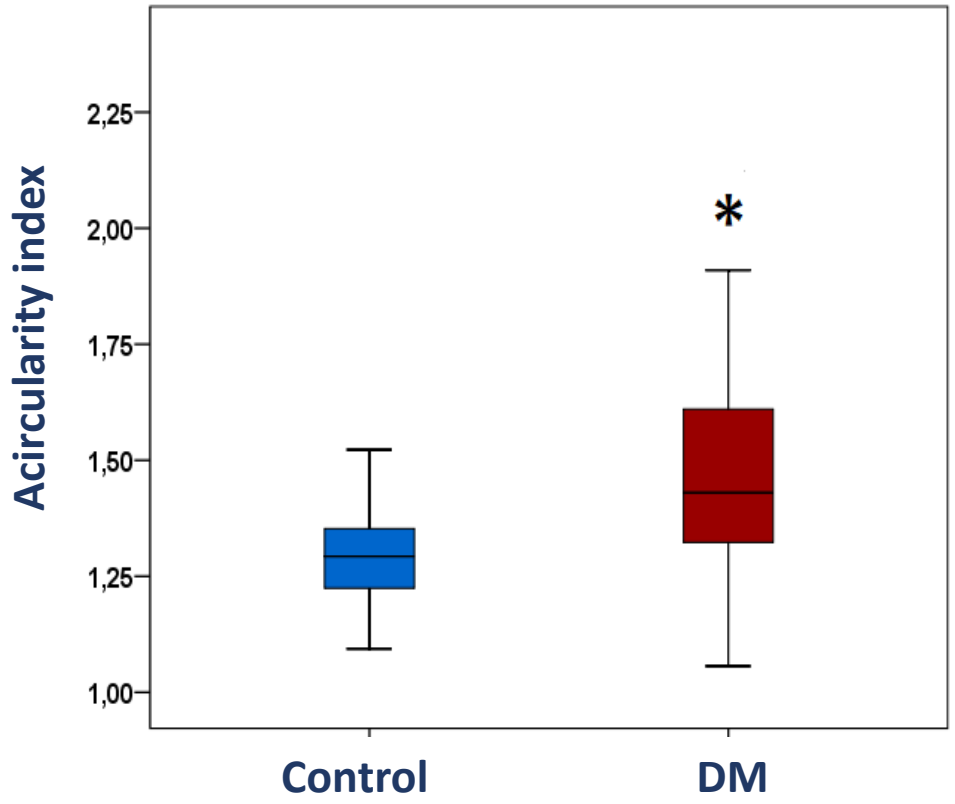


- Low-luminance deficit (LLD) was higher in T1DM patients (p<0,0001)
- LLD correlated with SD in SVP (R = -0,516, p<0,0001) and VD 300-600 in SVP

Results: OCT-A analysis

There was no difference in FAZ area between groups, but AI was significantly higher in DM group





Results: OCT-A analysis

Parameter	Control	DM	P-value
VD 0-300:			
SVP	29,00 ± 1,89	27,90 ± 2,29	**p=0,057**
ICP	29,61 ± 2,45	29,14 ± 3,10	p=0,694
DCP	18,29 ± 1,95	17,22 ± 3,10	**p=0,015***
VD 300-600:			
SVP	26,67 ± 1,81	25,37 ± 2,24	**p=0,028***
ICP	26,88 ± 3,04	26,45 ± 3,28	p=0,787
DCP	14,41 ± 1,02	14,37 ± 1,19	p=0,876
SD:			
SVP	0,31 ± 0,02	0,15 ± 0,01	**p<0,0001***
ICP	0,18 ± 0,02	0,19 ± 0,02	p=0,364
DCP	0,098 ± 0,006	0,095 ± 0,006	**p=0,015***
VDI:			
SVP	1,97 ± 0,07	1,96 ± 0,06	p=0,450
ICP	1,72 ± 0,13	1,69 ± 0,04	p=0,229
DCP	1,78 ± 0,03	1,80 ± 0,03	**p=0,036***

Baseline:

- A significant decline in VD and SD in SVP and DCP in DM group
- VDI was significantly higher in DCP in patients with DM

1 – year preliminary results:

- VD in SVP was significantly lower in DM patients comparing to the baseline
- No changes in other OCT-A parameters and LLVA deficit

Conclusions

- Changes in acircularity index precede FAZ enlargement and can be the earliest signs of FAZ remodeling at the preclinical stage of DR.
- Vessel density decline in SVP and DCP was observed in DM patients without apparent DR. A decrease in VD in SVP in one year can be a biomarker of DR progression.
- Changes in OCT-A parameters correlated with the increase in LLVA deficit in patients with DM. These findings can demonstrate a link between microvascular impairment and visual functions deficiency at the preclinical stage of DR.

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