Retinal vein occlusion : morphological study of retinal veins in SD-OCT and its correlations with clinical and angiographic findings

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Purpose:

Characteristic signs related to blood flow were described in spectral domain optical coherent tomography (SD-OCT) in patients with branch retinal vein occlusions[1]. The resulting image of the scan of the veins was either an hourglass-shape (HGS) when the blood flow was maintained (green arrow), or an homogeneous internal reflectivity (HR): slow flow <5mmseconds (blue arrow).
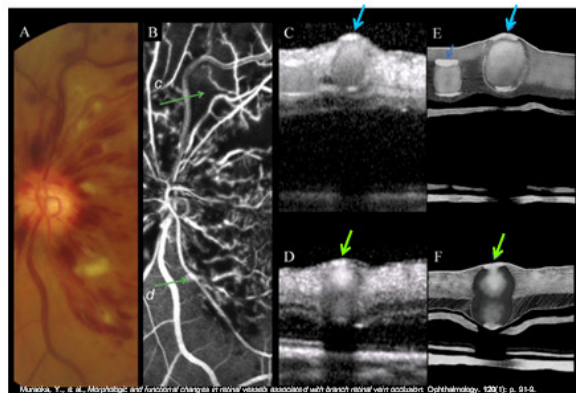
The purpose of this study was to analyze possible correlations between SD-OCT, clinical and angiographic findings.

Methods:

Prospective study of patients with branch (BRVO) or central retinal vein occlusion (CRVO). For each patient: major veins cross-sectional SD-OCT images, central retina thickness (CRT), visual acuity measurement, initial fluorescein angiography (and on request during follow-up) were performed.

Results:

The cross-sections of the major retinal veins showed an hourglass-shape in 19 patients and an homogeneous reflectivity in 21 patients. Mean difference between arterial filling time and venous filling time on angiography (Delta) in the homogeneous-reflectivity group was significantly longer than in the hourglass-shape group (11.0 seconds and 6.9 seconds respectively, p=0.004). Retinal ischemia was also larger in the homogeneous-reflectivity group (p=0.007).

		HGS	HR	total
Patients included		19	21	40
Occlusion type	branch	5	5	10
	hemicentral vein	6	0	6
	retinal vein	8	16	24
Age of occlusion	recent (<2 months)	11	10	21
	long standing (>2 months)	8	11	19
Risk factors of vein occlusion	arterial hypertension	7	8	15
	diabetes	1	2	3
	dyslipidemia	7	4	11
	sleep apnea syndrom	0	3	3
	glaucoma	6	8	14
mean age (years)		65,5	67,7	66,7 p=0,65
mean best corrected Visual Acuity logMAR (Snellen)		0,57 (0,3)	0,84 (0,15)	0,64 (0,25) p=0,16

Table 1: Baseline Characteristics
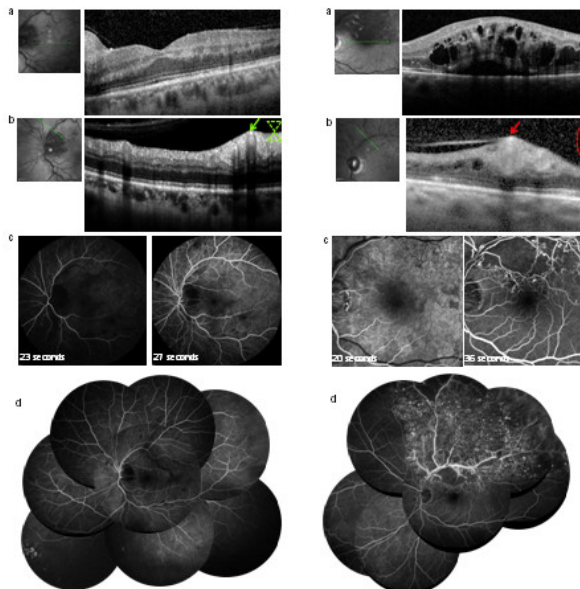

Figure 1: 40 year-old man with recent (< 1month) retinal vein occlusion. Macular section SD-OCT find a normal macular thickness (a) and vein cross-sectional SD-OCT (b) shows hourglass shape (green arrow). Difference between arterial and venous filling time (c) on fluorescein angiography is 4 seconds and no peripheral ischemia (d).

Figure 2: 41 year-old man with 18 months branch retinal vein occlusion. Baseline macular section SD-OCT find a cystoid macular edema (a) and vein cross-sectional SD-OCT (b) shows homogeneous reflectivity (red arrow). Difference between arterial and venous filling time (c) on fluorescein angiography is 16 seconds and peripheral superior temporal ischemia (d).

	HGS	HR	p	95% confindence interval
mean age (years)	65,6	67,7	0,65	
mean best corrected Visual Acuity (logMAR)	0,57	0,84	0,16	
mean arterial filling time (seconds)	22,2	24	0,414	
mean venous filling time (seconds)	29,1	35,1	0,041	
mean delta (seconds)	7	11,1	0,004	1,42-6,79
mean central foveal Thickness (µm)	406	576	0,056	
retinal ischemia*	1	2,3	0,004	0,48-2,29

Table 2: Comparison between clinical, CRT, angiographic findings and veins cross sectional SD-OCT images.
*retinal ischemia was evaluated on fluorescein angiography and graded from 0 to 5
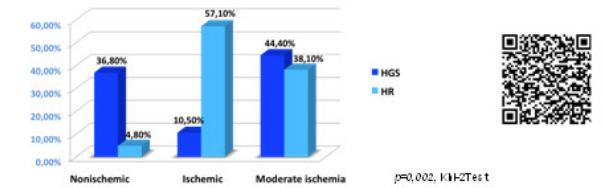

Figure 3: Distribution of veins cross-sectional SD-OCT images by ischemic, nonischemic or moderate ischemic retinal vein occlusion types.
Retinal ischemia was classified in three groups based on its extend measures on angiography
 -Nonischemic retinal vein occlusion
 -Retinal ischemia was established through different parameters including visual acuity, retinal transit time and non-perfusion areas on fluorescein angiography, and OCT [2,3,4,5]
-Moderate ischemia was defined as non-perfusion areas < 50% of the occluded territories and did not meet the criteria of ischemic type.

	SENSIBILITY N=14 (3/11)*	SPECIFICITY N=26 (13/13)*
1. OCT : presence of HR	86% (66% / 91%)	65% (46% / 85%)
2. OCT CRT (≥700µ)	29% (100% / 9%)	88% (85% / 85%)
1. ANGIO DELTA (≥10sec)	50% (33% / 55%)	68% (50% / 85%)
2. ANGIO Nonperfusion (≥50%) ≥2,5 CRVO, ≥1 BRVO, ≥ 2 Hemicentral vein occlusion	100% (100% / 100%)	96% (100% / 92%)
Visual acuity (≤20/200)	62% (100% / 55%)	81% (92% / 77%)
ANGIO 2 criteria (1 or 2)	100% (100% / 100%)	69% (54% / 85%)
OCT 2 criteria (1 or 2)	93% (100% / 91%)	65% (46% / 69%)
VA+OCT (1 or 2 or 3)	100%	58%

Table 3: Sensibility and specificity of different diagnostic tools to distinguish ischemic retinal vein occlusion.
* Total (recent<2months / long standing≥ 2months)

Bibliography:

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Conclusion:

These results confirmed that the presence of homogeneous reflectivity on SD-OCT is correlated to more severe RVO forms with slower venous circulation and with retinal non-perfusion.