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Optical Coherence Tomography Angiography of Brachytherapy Induced Radiation Retinopathy in Choroidal Melanoma Patients

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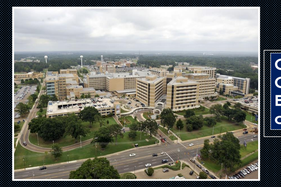

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Purpose:

To report Optical Coherence Tomography Angiographic (OCT-A) findings on choroidal melanoma patients with radiation retinopathy induced by brachytherapy.

Design:

Retropspective observational case series.

Materials and Method:

OCT angiography vessel density analysis using Optovue AngioAnalytics software on choroidal malignant melanoma patients with radiation retinopathy induced by brachytherapy.

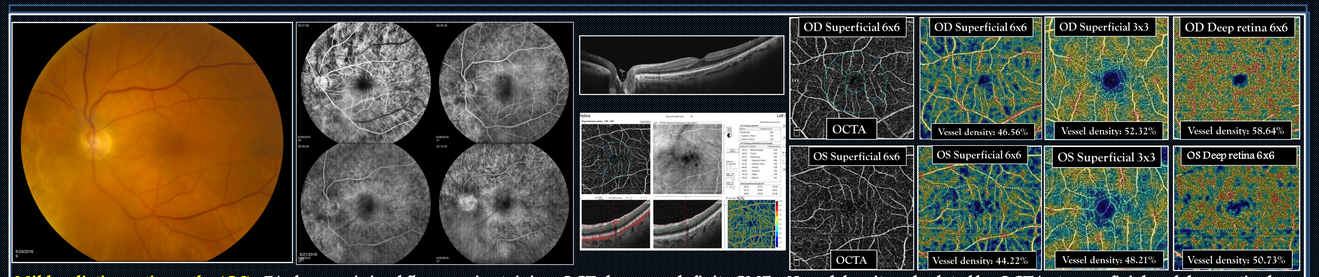
- Patients:
  - Total number: 10
  - Sex: M/F= 4/6
  - Race: All Caucasians
  - Age: mean 67 (56-79)

Result:

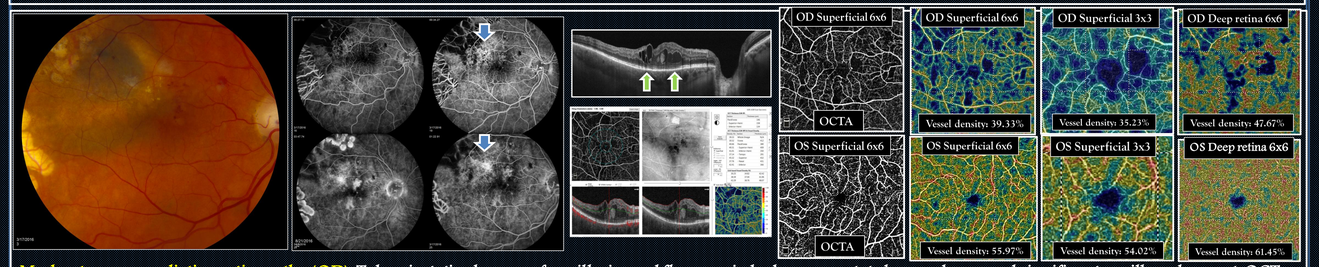
Severity of RR	Mild : 3 cases	Moderate: 4 cases	Severe: 3 cases
Visual acuity	Mean: 20/30 (20/25-20/40)	Mean: 20/50 (20/40- 20/60)	Mean: 20/315 (20/150-20/400)
Average CFT	317μ (308μ-334μ)	334μ(303μ-401μ)	385μ (254μ-463μ)
OCT	None to minimal CME	Moderate CME	Severe CME

Table 1: Severity of radiation retinopathy

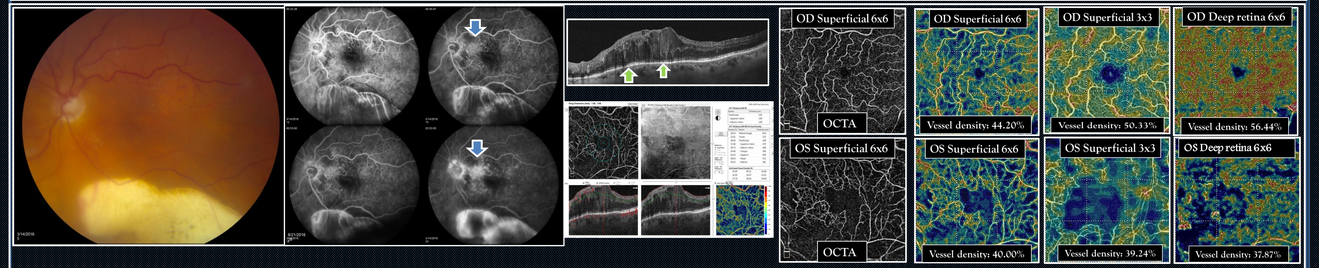
- In 10 eyes with radiation retinopathy, OCT-A showed an overall reduction of 9.41% vessel density in superficial layer and 9.65% in deep layer of the retina in 6x6mm macular scan when compared to the opposite eyes.



Mild radiation retinopathy (OS) : FA shows minimal fluorescein staining. OCT shows no definite CME. Vessel density calculated by OCTA at superficial and deep retinal slabs in OS is decreased when compare to the contralateral good eye (OD).



Moderate severe radiation retinopathy (OD): Telangiectatic changes of capillaries and fluorescein leakage, punctate hemorrhages and significant capillary drop out. OCT shows significant macular edema . Vessel density calculated by OCTA at superficial and deep retinal slabs in OD is decreased when compare to the contralateral good eye (OS).



Severe radiation retinopathy (OS): FA shows multiple microaneurysms with severe leakage of fluorescein. OCT shows severe CME. OCTA of superficial and deep retinal slabs at 6x6 and 3x3 mm² areas shows significant decreased vessel density when compared to the normal OD

- Vascular density reduction of 9.35% in superficial and 10.34% in deep retinal layer in parafoveal 3mm circular section.
- In 3 early RR patients without macular edema on OCT, microvascular changes, capillary non-perfusion and vascular density changes were successfully identified by OCTA

Segmentation plans / Areas of Measurement	Superficial retinal slab	Deep retinal slab
Mild RR 6x6mm²	-3.07% (0 → -4.11)	-1.51% (-0.31 → -2.41)
Parafoveal (3x3 circle)	-4.68 %(-2.46 → -6.64)	-2.73 %(-2.23 → -3.31)
Foveal circle (1x1 circle)	-1.35 %(-1.52 → -4.99)	- 8.92 % (0.49 → -10.32)
Mod. RR 6x6mm²	-13 % (-9.11 → -16.64)	-10.57 % (-4.56 → -13.78)
Parafoveal (3x3 circle)	-11.86 % (-8.88 → -16.09)	-11.56 % (-6.40 → -12.87)
Foveal circle (1x1 circle)	-8.02 % (-0.47 → -17.75)	8.29 % (-7.56 → 20.40)
Severe RR 6x6mm²	-10.00 % (=6.10 → -13.81)	-19.91 % (-18.47 →-21.35)
Parafoveal (3x3 circle)	-11.34 % (-4.08 → -18.59)	-19.3 % (-15.80 → -22.81)
Foveal circle (1x1 circle)	-9.04 % (-8.84 → -9.24)	-7.09 % (-3.60 → -10.57)

Table 2: Vessel Density Reduction in Radiation Retinopathy

Conclusion:

- OCT Angiography can detect the early radiation retinopathy without the need for contrast media.
- The vascular density is reduced in all patients with radiation retinopathy when compared to the normal contralateral eye regardless of the severity of the disease.
- AngioAnalytic software is still under investigation, there is a potential issue with the vessel density calculation at the deep retinal slab due to the projection artifacts.
- The vascular density reduction appears to occur in both the superficial and deep retinal slabs. Deep retinal layer appears to be more affected than the superficial retinal layer in the more severe cases, regardless of potential addition of projection artifact.

Financial interest disclosure:
Ching J. Chen, MD: Consultant: Optovue, Clinical advisory board: Allergan. Speaker: Alcon International, Clinico
Mathew Olsen, CRA, Brian Tieu, Jordan Burnham MD: No financial interest to be disclosed