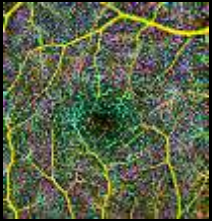
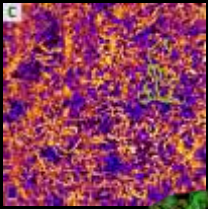




Northwestern University Feinberg School of Medicine



3D lesion complexity is associated
with treatment intensity in choroidal
neovascularization



Amani Fawzi, MD

*Cyrus Tang and Lee Jampol Professor of
Ophthalmology
Northwestern University*



No Relevant Financial disclosure

- Roche, Consultant

OPTICAL COHERENCE TOMOGRAPHY ANGIOGRAPHY VERSUS TRADITIONAL MULTIMODAL IMAGING IN ASSESSING THE ACTIVITY OF EXUDATIVE AGE-RELATED MACULAR DEGENERATION

A New Diagnostic Challenge

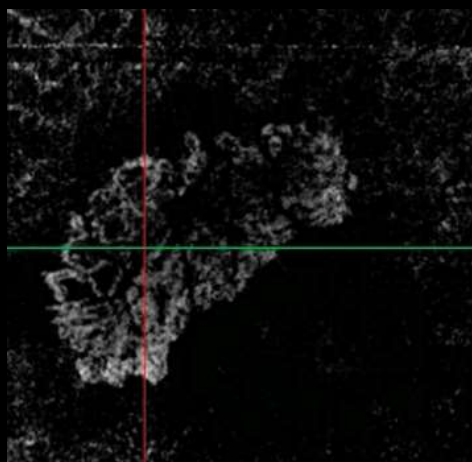
GABRIEL J. COSCAS, MD,*† MARCO LUPIDI, MD,*‡ FLORENCE COSCAS, MD,*†
CARLO CAGINI, MD,‡ ERIC H. SOUIED, MD, PhD†

Conclusion: This study demonstrates a high level of correspondence, in patients with exudative age-related macular degeneration, between different CNV patterns identified on OCTA and treatment decisions established on conventional multimodal imaging. Although fluorescein angiography remains the gold standard for determining the presence of leakage, and OCT shows fluid accumulation and its variations, OCTA may now offer noninvasive monitoring of the CNV, aiding for each treatment decision during the follow-up.

RETINA 35:2219–2228, 2015



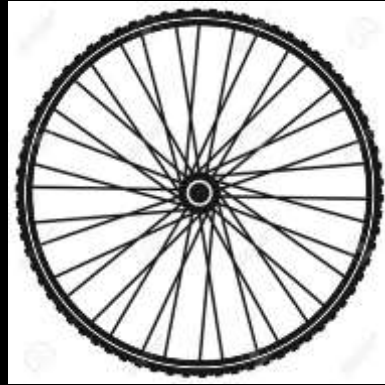
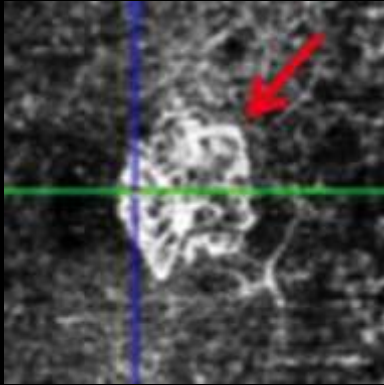
Caput medusae



El Ameen et al., Retina. 35:2212–2218, 2015



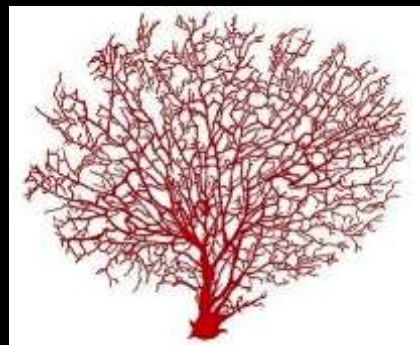
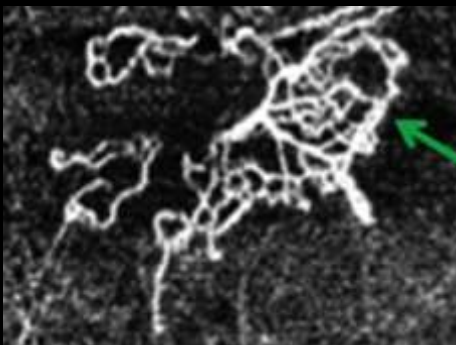
Lacy wheel



Coscas et al., Retina. 35:2219–2228, 2015



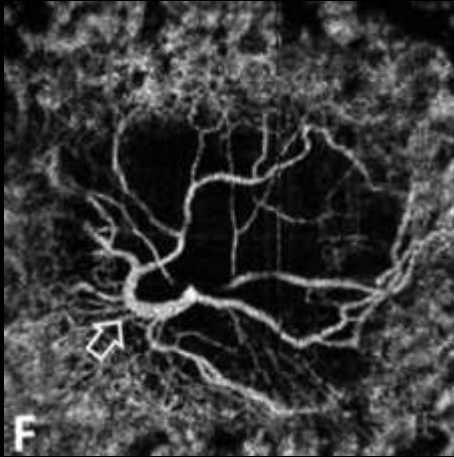
Seafan



Coscas et al., Retina. 35:2219–2228, 2015

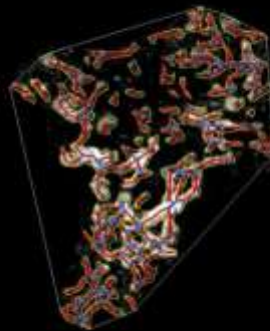


Dead tree





Angiotool Software for quantitative assessment of CNV



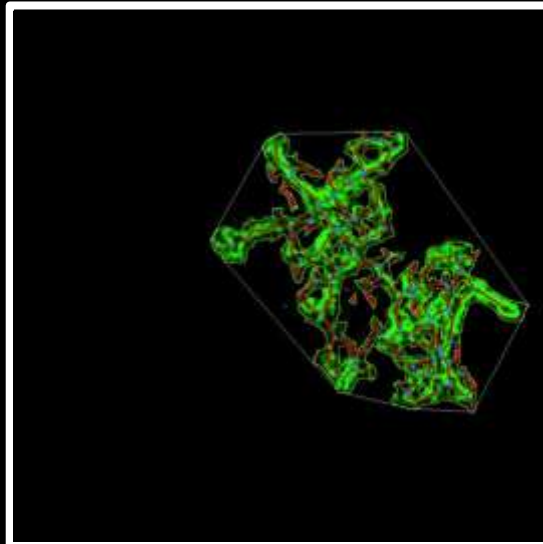


Methods

- Patients with CNV on different treatment intervals
 - < or > 6wks:
 - low frequency injections; “good responders”
 - vs. high-frequency injections; “poor responders”
- Qualitative evaluation
- Quantitative analysis

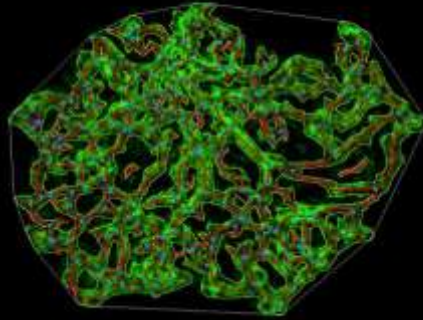


CNV analysis (AngioTool)

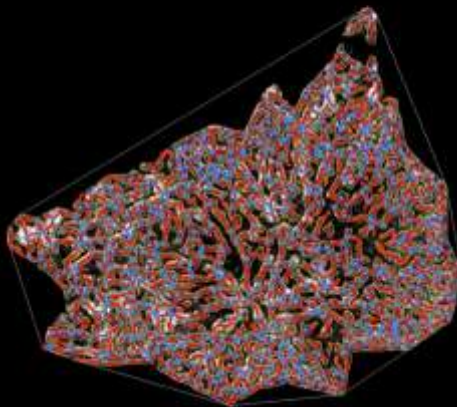




Low-frequency Responder



High-frequency responder



Results:

- No qualitative or quantitative differences between "low injection frequency" and "high frequency" lesions

Qualitative Analysis

	Good responders (n=7)	Poor responders (n=7)	p-value
Shape ("seafan" or "lacy wheel") detected (n)	3 (43%)	1 (14%)	0.237
Anastomoses and vessel loops (peripheral arcade) (n)	6 (86%)	6 (86%)	1.0
Branching (small capillaries)	1 (14%)	2 (29%)	0.515
Vessel termini (peripheral arcade)	4 (57%)	1 (14%)	0.094
Peri-lesion halo	3 (43%)	5 (71%)	0.280

Quantitative Analysis

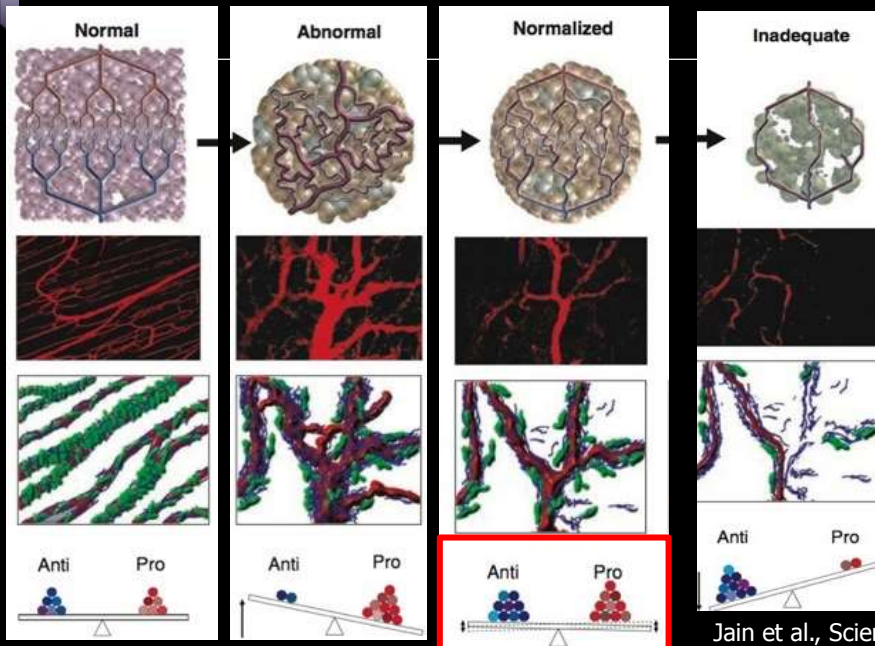
	Good responders (n=7)	Poor responders (n=7)	p-value
Lesion area (mm ²)	1.32	1.00	0.805
Vessels area (mm ²)	0.63	0.39	0.535
Vessel percentage area (%)	51.11	37.80	0.097
Number of junctions	85	48	0.456
Junctions density	0.000622	0.000440	0.383
Total vessel length (mm)	14.06	8.83	0.620
Average vessel length (mm)	2.19	1.39	0.209
Number of end points	40	38	0.805
Average lacunarity	0.20	0.22	0.259

SEMIAUTOMATED QUANTITATIVE APPROACH TO CHARACTERIZE TREATMENT RESPONSE IN NEOVASCULAR AGE-RELATED MACULAR DEGENERATION
A Real-World Study

PHILIPP K. ROBERTS, MD¹; PETER L. HOPFER, BA²; MANNOT K. GILL, MD¹; AMANDA J. FANZL, MD¹

Retina 2017. 37 (8), 1492-1498

Vascular Normalization Theory



Jain et al., Science 2005. 307(5706):58-62.

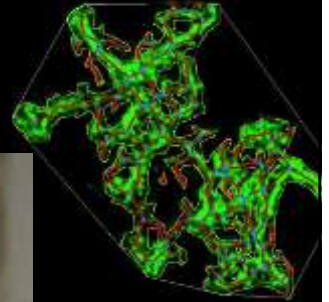
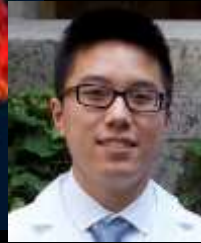
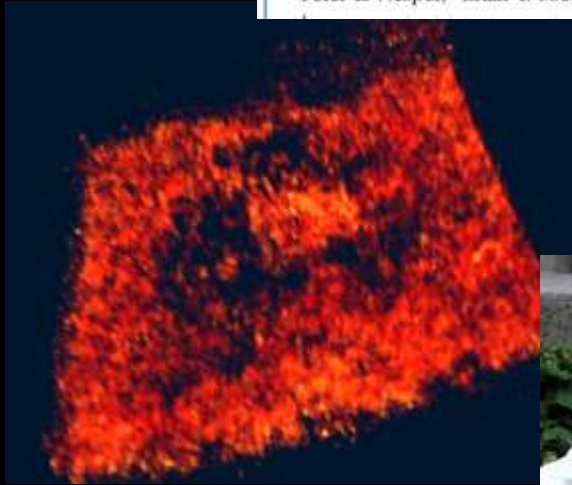


Retina

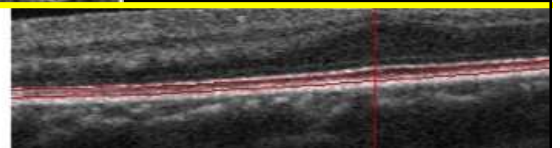
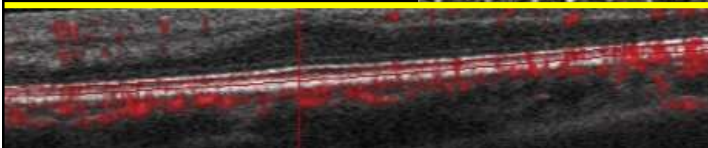
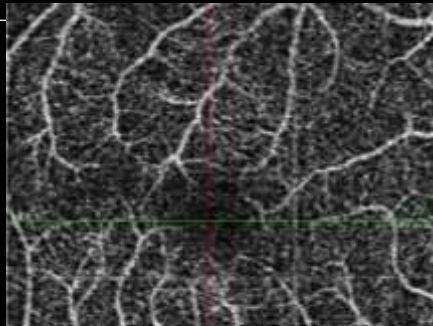
Volume-Rendered Projection-Resolved OCT Angiography: 3D Lesion Complexity Is Associated With Therapy Response in Wet Age-Related Macular Degeneration

Peter L. Nesper,¹ Brian T. Soetikno,¹⁻³ Alison D. Treister,¹ and Amani A. Fawzi¹

IOVS | April 2018 | Vol. 59 | No. 5 | 1945



Blood Vessels are Projected onto Hyper-Reflective Layers Below



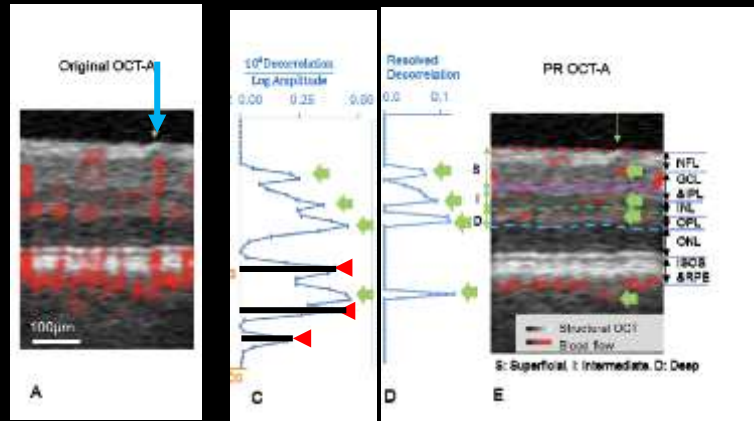
Segmentation
Boundaries



Projection-resolved optical coherence tomographic angiography

Miao Zhang, Thomas S. Hwang, J. Peter Campbell, Steven T. Bailey, David J. Wilson, David Huang and Yali Jia*

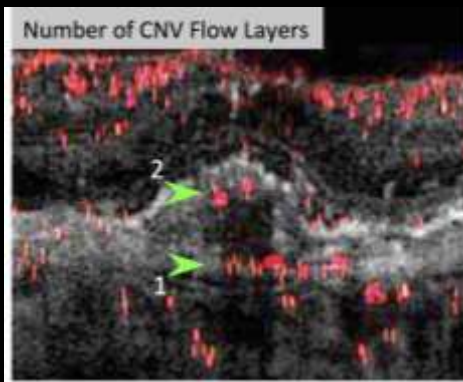
Casey Eye Institute, Oregon Health & Science University, Portland, OR 97239, USA
*jia@ohsu.edu



1 Mar 2016 | Vol. 7, No. 3 | DOI:10.1364/BOE.7.000816 | BIOMEDICAL OPTICS EXPRESS 816



Projection – removal software in OCTA



more than one CNV flow layer!

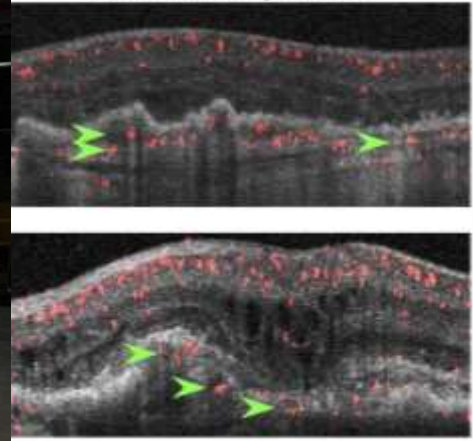


Double and Triple Deckers!



Layers = 2

CNV Flow Layers = 3



CNV that require more frequent injections are more complex in 3D

TABLE 2. PR-OCTA Parameters Based on Response to Anti-VEGF Therapy

Responder Group	All Subjects		
	Good	Poor	<i>P</i>
Highest CNV flow signal, μm (SD)	90 (80)	152 (68)	<0.01*
No. of CNV flow layers	1.76 (0.69)	2.21 (0.63)	0.022*
CNV flow signal thickness, μm (SD)	63 (72)	123 (47)	<0.01*
Eyes with hyperreflective foci (%)	9 (31)	16 (73)	<0.01*
SSI (SD)	56 (4)	55 (4)	0.405

"Good response" = low frequency: injection interval > 6 weeks

"Poor response" = high frequency: more frequent injections



hypothesis

- Persistent leakage in non-responsive CNV → Accumulation of fibrin on CNV surface → forming scaffold for growth of second, third vascular layers

MORPHOLOGY OF EARLY CHOROIDAL NEOVASCULARISATION IN AGE-RELATED MACULAR DEGENERATION: CORRELATION WITH ACTIVITY

J. P. SARKIS¹, E. H. SARKIS² and M. C. KILLINGSWORTH¹
Sydney, Australia

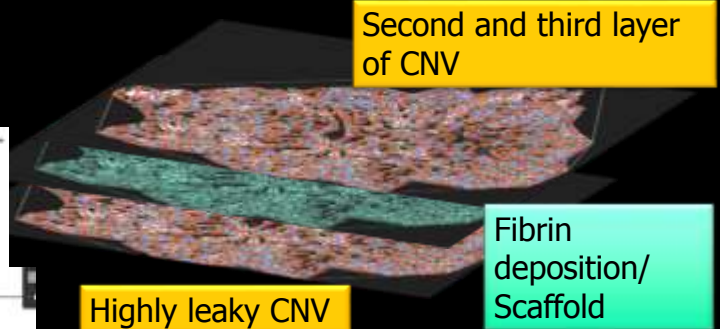
Macrophage and retinal pigment epithelium expression of angiogenic cytokines in choroidal neovascularization

Hans E. Grossniklaus,¹ Jun X. Ling,² Timothy H. Wallace,³ Stefan Dittmar,⁴ Hans H. Larsson,⁵ Cynthia Cohen,⁶ Victor M. Elner,⁷ Susan G. Elner,⁸ Paul Sternberg, Jr.⁹

CLINICAL SCIENCES

Histopathologic and Ultrastructural Findings of Surgically Excised Choroidal Neovascularization

Hans E. Grossniklaus, MD, W. Richard Green, MD, for the Submacular Surgery Trials Research Group



Single Decker

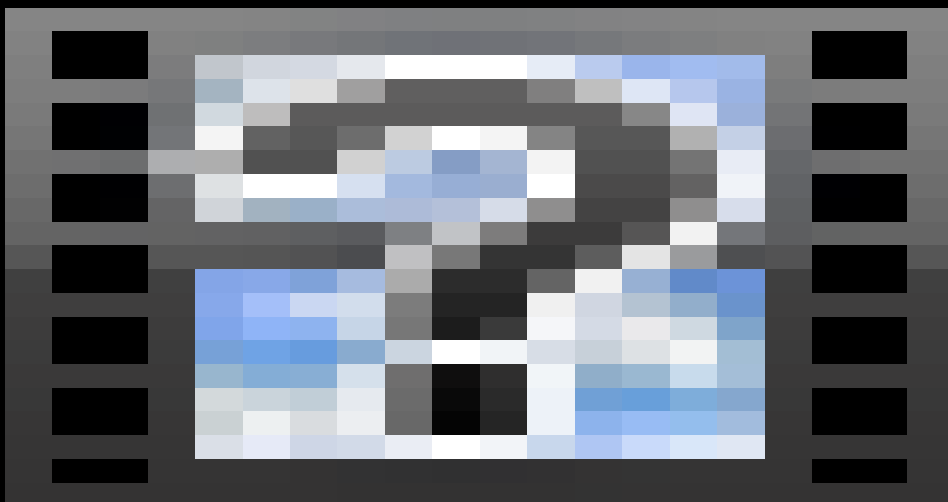




Double decker



Triple decker





Summary

- CNV lesions are complex in 3D
- 3D CNV complexity could be a marker of lesions that need more frequent intravitreal injections
- The search for other quantitative parameters that correlate with CNV activity and treatment continues



Acknowledgments



Brian Soetikno, MSTP



Peter Nesper, BA



Philipp Roberts, MD



Scan me

