OCT Angiography: The Next Generation

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Overview

- Describe what optical coherence tomography angiography (OCTA) is
- Compare and contrast OCTA to other imaging technologies
- Discuss clinical utility of OCTA now and in the future

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Optical Coherence Tomography (OCT)

- Technology developed in the 1990s, developed commercially in the last 20 years
- Now integral to clinical care
- Provides high-resolution structural information about ocular tissues

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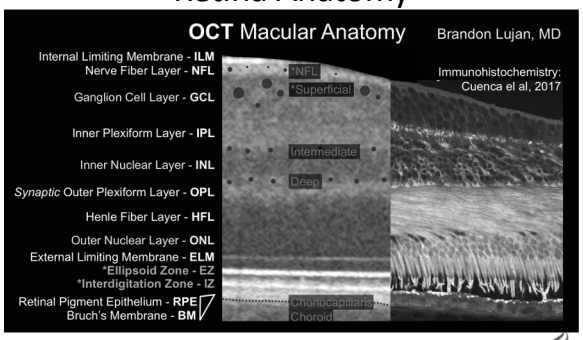
Retina Anatomy



4 Slide courtesy of Brandon Lujan, MD

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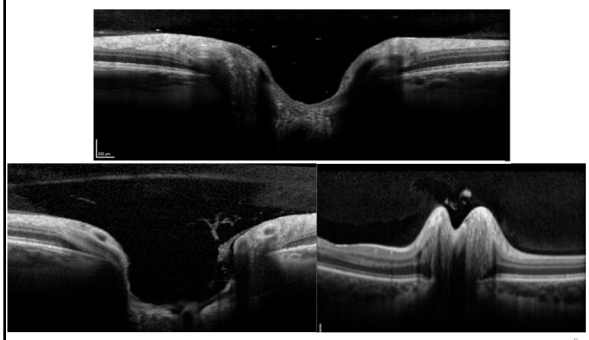
Optic Nerve Anatomy



Images found at: https://retinagallery.com/displayimage.php?pid=5418,

5 https://know-the-eye.heidelbergengineering.com/eye-disorders/impaired-vision-of-unknown-origin/

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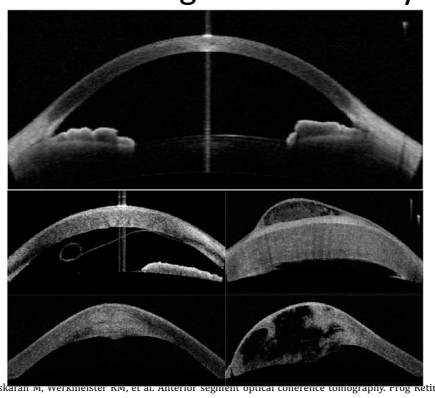
Anterior Segment Anatomy



6 Ang M, Baskaran M, Werkmeister RM, et al. Anterior segment optical coherence tomography. Prog Retin Eye Res. 2018;66:132-156.

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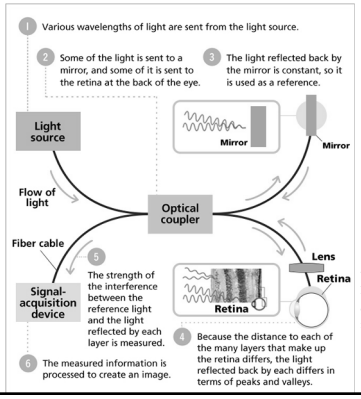
How OCT works



. https://global.canon/en/technology/support02.html

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Angiography

https://www.healthline.com/health/cerebral-angiography

https://medicine.uiowa.edu/eye/patient-care/imaging-services/fluorescein-angiography

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OCT Angiography

- Applies OCT principles to allow angiography- detection of blood flow and structure of blood vessels
- High resolution down to the capillary level
- Furthers the diagnostic potential of OCT technology

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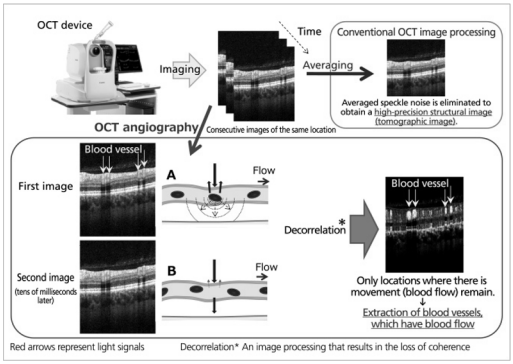
How OCTA works



10 https://global.canon/en/technology/support02.html

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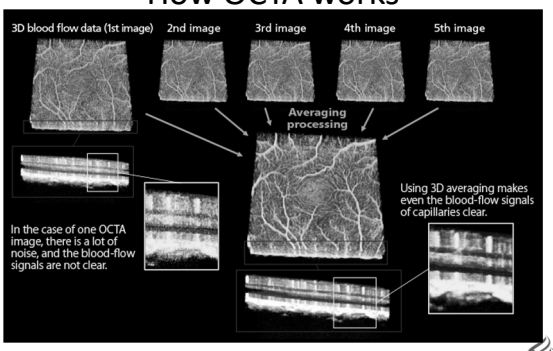
How OCTA works



11 https://global.canon/en/technology/support02.html

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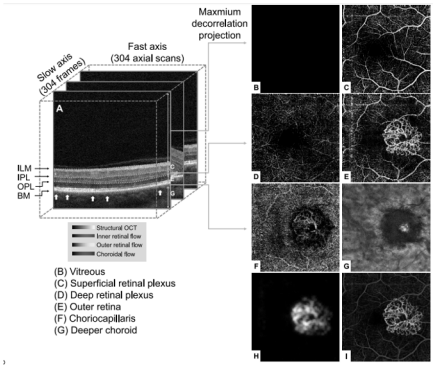
Layer-Specific Retinal Flow



12 Gao SS, Jia Y, Zhang M, et al. Optical Coherence Tomography Angiography. Invest Ophthalmol Vis Sci. 2016;57(9):OCT27-36.

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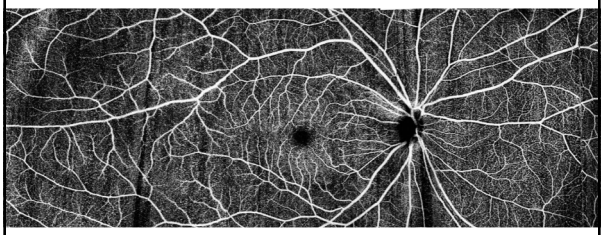
Normal Retinal OCTA



13 Gao SS, Jia Y, Zhang M, et al. Optical Coherence Tomography Angiography. Invest Ophthalmol Vis Sci. 2016;57(9):OCT27-36.

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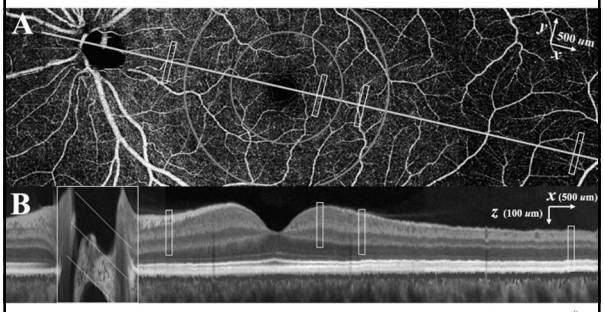

14 Campbell JP, Zhang M, Hwang TS, et al. Detailed Vascular Anatomy of the Human Retina by Projection-Resolved Optical Coherence Tomography Angiography. Sci Rep.

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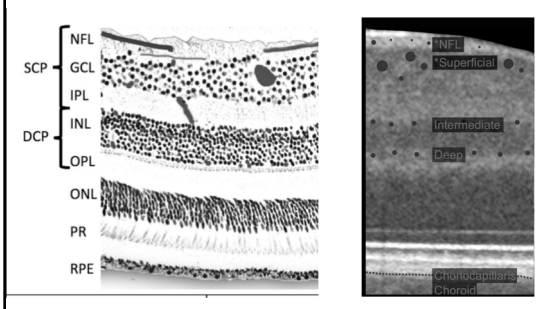
Normal Retinal Vasculature



15 Campbell JP, Zhang M, Hwang TS, et al. Detailed Vascular Anatomy of the Human Retina by Projection-Resolved Optical Coherence Tomography Angiography. Sci Rep. 2017;7:42201.
Photo courtesy of Brandon Lujan, MD

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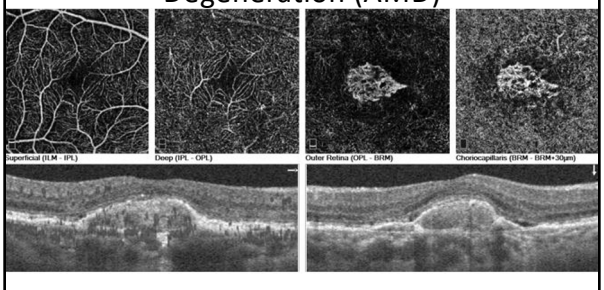
OCTA and Age-related Macular Degeneration (AMD)



16 https://amdbook.org/book/export/html/509

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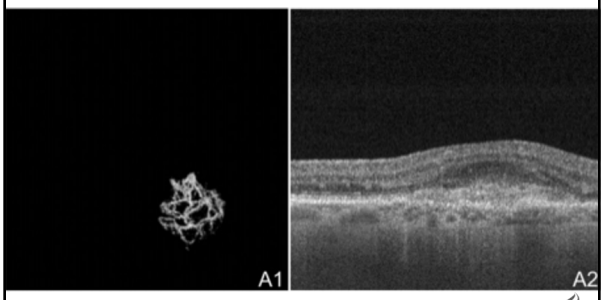
OCTA and Age-related Macular Degeneration



17 De carlo TE, Romano A, Waheed NK, Duker JS. A review of optical coherence tomography angiography (OCTA). Int J Retina Vitreous. 2015;1:5.

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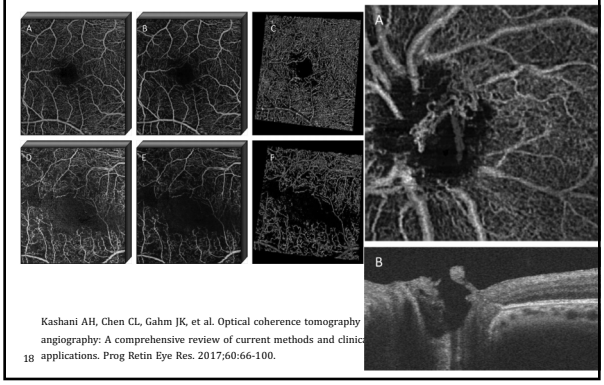
OCTA and Diabetic Retinopathy



18 Kashani AH, Chen CL, Gahm JK, et al. Optical coherence tomography angiography: A comprehensive review of current methods and clinica applications. Prog Retin Eye Res. 2017;60:66-100.

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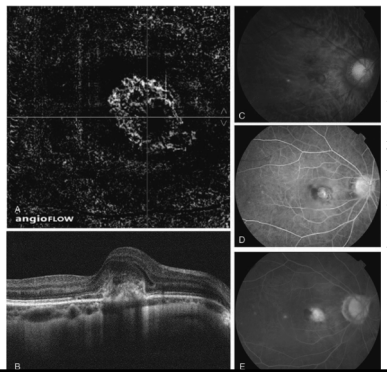
OCTA and other retinal conditions



Liu B, Bao L, Zhang J. Optical Coherence Tomography Angiography Of Pathological Myopia Sourced and Idiopathic Choroidal Neovascularization With Follow-Up. Medicine (Baltimore). 2016;95(14):e3264.

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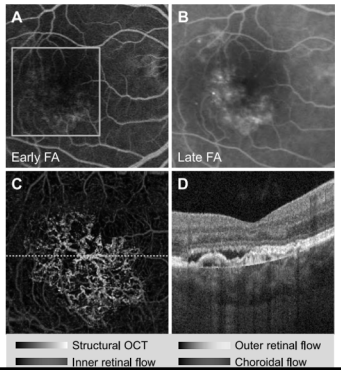
OCTA and other retinal conditions



Gao SS, Jia Y, Zhang M, et al. Optical Coherence Tomography Angiography. Invest Ophthalmol Vis Sci. 2016;57(9):OCT27-36.

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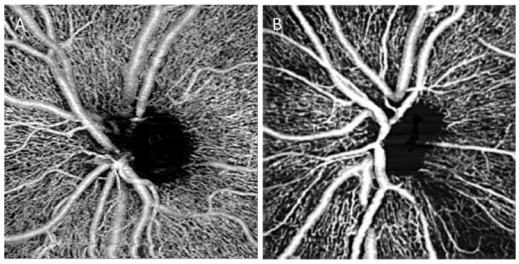
OCTA and Glaucoma



Kashani AH, Chen CL, Gahm JK, et al. Optical coherence tomography angiography: A comprehensive review of current methods and clinical applications. Prog Retin Eye Res. 2017;60:66-100.

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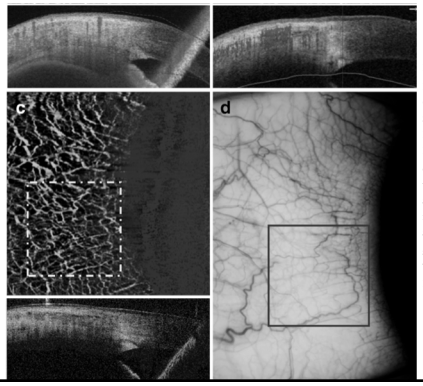
Anterior Segment OCTA



Lee WD, Devarajan K, Chua J, Schmetterer L, Mehta JS, Ang M. Optical coherence tomography angiography for the anterior segment. Eye Vis (Lond). 2019;6:4.

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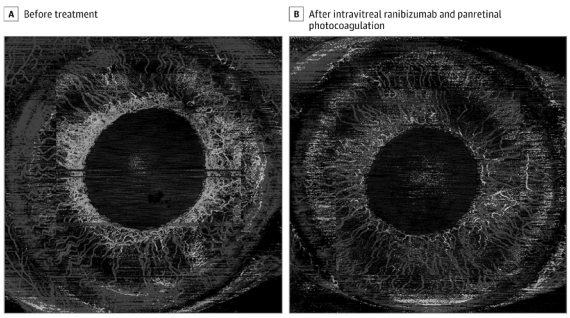
Iris Vasculature OCTA



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Limitations

- OCT limitations
- Field of view
- Cost and reimbursement

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The future of OCTA

- Faster scans, higher resolution
- More affordable
- Fully replacing other angiography

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Thanks!

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References

Akagi T, Fujimoto M, Ikeda HO. Anterior Segment Optical Coherence Tomography Angiography of Iris Neovascularization After Intravitreal Ranibizumab and Panretinal Photocoagulation. JAMA Ophthalmol. 2020;138(2):e190318.

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