Effect of Sildenafil Citrate on Choroidal Thickness in Age-Related Macular Degeneration

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PURPOSE

• To investigate choroidal vascular compliance in age-related macular degeneration (AMD) by measuring choroidal thickness changes after a single-dose of oral sildenafil citrate.

BACKGROUND

• Previous studies have shown that AMD may have choroidal thinning.

• However, it is unclear if choroidal thickness partakes in the pathogenesis of AMD, and if increasing choroidal thickness may potentially alter the disease course.

• Past studies have shown that a single dose of the phosphodiesterase type-5 inhibitor sildenafil citrate can increase choroidal thickness in young healthy patients using enhanced-depth optical coherence tomography (EDI-OCT).

• We hypothesize that sildenafil may also increase choroidal thickness in eyes with AMD and perhaps potentially reduce AMD progression.

• Alternatively, if sildenafil has minimal effect on choroidal thickness in eyes with AMD, such results may suggest that choroidal vascular compliance or stiffness is reduced in this condition.

METHODS

• EDI-OCT images were evaluated from 18 eyes of 9 adults with neovascular AMD in one eye and non-neovascular AMD in the other, at times zero, one and three hours after the oral administration of 100 mg sildenafil citrate.

• One patient also underwent OCT angiography (OCTA) imaging of both eyes pre-sildenafil adminsitration and 3 hours post-sildenafil administration.

• Exclusion criteria included history of ocular laser treatment, ocular ionizing irradiation, transpupillary thermotherapy, vitreoretinal surgeries, vitreoretinal diseases other than AMD, myopia of more than 6 diopters (D) spherical equivalent, current use of oral phosphodiesterase type 5 inhibitors, current use of systemic corticosteroids and any contraindication to sildenafil use.

• Choroidal thickness was measured at the fovea and at 0.5mm intervals up to 1.5mm nasal and temporal to the fovea, and averaged across the central 3mm.

• One-way analysis of variance with Dunnett's post-tests were used to compare choroidal thickness changes after sildenafil treatment.

• Paired t-tests were used to compare choroidal thickness between fellow eyes with neovascular AMD and non-neovascular AMD.

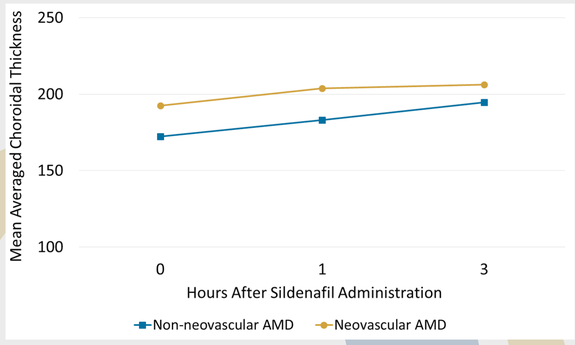
RESULTS

TABLE 1. **Baseline demographics and clinical characteristics**

	All eyes (n=18)	Eyes with Dry AMD (n=9)	Eyes with Wet AMD (n=9)
Age (years), mean ± SD	76.22 ± 6.50	76.22 ± 6.50	76.22 ± 6.50
Sex (male/female)	2/7	2/7	2/7
Eye (OD/OS)	4/5	4/5	4/5
Lens (Phakic/Pseudophakic)	14/4	7/2	7/2
BCVA (logMAR), mean ± SD	0.32 ± 0.23	0.22 ± 0.16	0.42 ± 0.26
IOP (mm Hg), mean ± SD	15.50 ± 4.72	15.44 ± 3.54	15.56 ± 5.90
Refractive Error (D), mean ± SD	0.76 ± 1.07	0.67 ± 1.27	0.88 ± 0.92

• Baseline choroidal thickness was 172.35µm ± 54.47µm and 192.62µm ± 92.15µm for eyes with non-neovascular and neovascular AMD, respectively.

FIGURE 1. **Mean averaged choroidal thickness at different time points of sildenafil administration**



• In eyes with neovascular AMD, choroidal thickness increased by 10.1% (19.35 µm, P=0.005) at 1 hour, and 11.5% (21.93 µm, P=0.046) at 3 hours after sildenafil administration.

• In eyes with non-neovascular AMD, choroid thickness increased by 6.7% (11.6 µm, P=0.059) and 11.9% (20.64 µm, P=0.002) at 1 and 3 hours.

• There was no significant difference in choroidal thickness measurements between fellow eyes with non-neovascular versus neovascular AMD after sildenafil treatment at any time point (P=0.198–0.560).

• Eyes with reticular pseudodrusen and geographic atrophy showed less choroidal thickening at 3 hours (P=0.019 and P=0.050), but number of prior anti-VEGF injections (P=0.148 at 1 hour and P=0.717 at 3 hours) did not impact choroidal response to sildenafil administration.

• OCTA showed up to 37% and 31% increase in choroidal vascular diameter within Haller's and Sattler's layer in the eyes with neovascular and non-neovascular AMD, respectively.

FIGURE 2. **Images of horizontal EDI-OCT line scans through the fovea at different time points of sildenafil adminsitration**

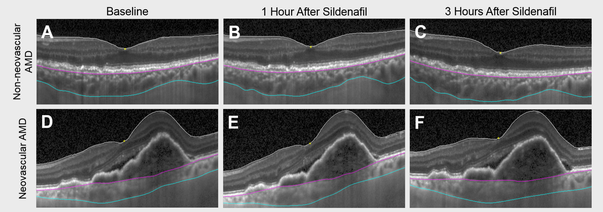
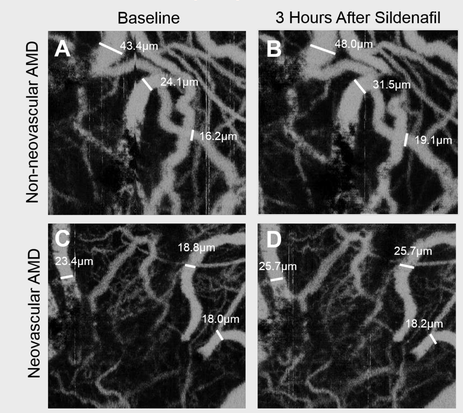


FIGURE 3. OCTA images of Haller's layer at baseline (A & C) and at 3 hours (B & D) after oral sildenafil treatment in an eye with non-neovascular AMD (A-B) and fellow eye with neovascular AMD (C-D).



CONCLUSION

• Sildenafil citrate increases choroidal thickness in both neovascular and non-neovascular AMD.

• Eyes with non-neovascular AMD demonstrate a slower rate of increase, particularly in the presence of reticular pseudodrusen and geographic atrophy, suggesting that reduced choroidal vascular compliance may play a role in the pathogenesis of some forms of AMD.

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