# 2687 Retinal Oximetry in Open-Angle Glaucoma

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## Purpose

To test whether glaucomatous visual field defect is associated with alterations in retinal vascular oxygen saturation in patients with open-angle glaucoma.

## Methods

A non-invasive spectrophotometric retinal oximeter (Oxymap ehf, Reykjavík, Iceland) was used to measure oxygen saturation in retinal arterioles and venules. The oximeter consists of a fundus camera, beam splitter and light filters. Specialized software calculates the oxygen saturation based on light absorbance at 605nm and 586nm.

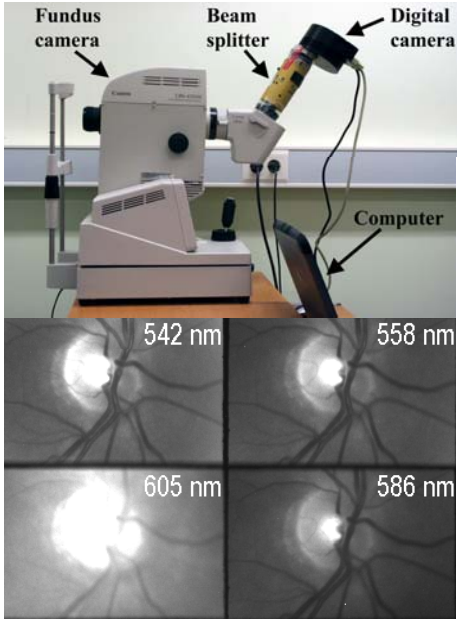


***Figure 1.*** *The retinal oximeter.*
***Above:*** *Components.* ***Below:*** *A typical output.*

Specialized software automatically selects points on vessels and adjacent fundus for calculation of optical density ratios (ODRs). ODRs have an approximately linear inverse relationship with hemoglobin oxygen saturation [Beach JM et al. J Appl Physiol 1999;86(2):748-58].

Forty-five patients with open-angle glaucoma (OAG) with and without pseudoexfoliation syndrome (PEX) underwent spectrophotometric retinal oximetry and Octopus 123 visual field evaluation. Oximetry was performed in 1st and 2nd degree retinal arterioles and venules. Perimetry was performed during a routine visit to an ophthalmologist.

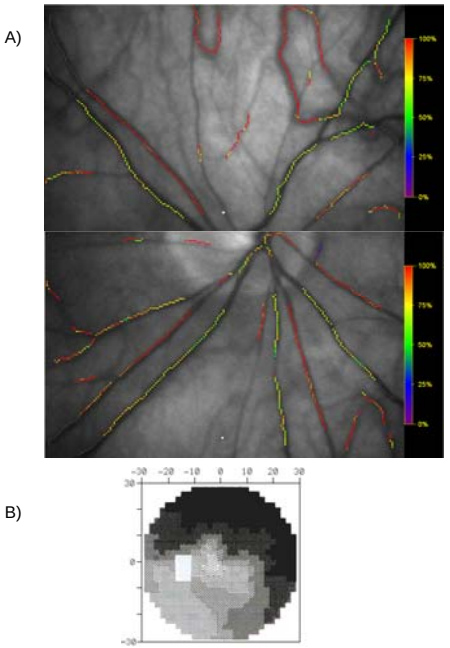


***Figure 2.*** *All data is from the same eye.* ***A)*** *Pseudocolor maps of a fundus showing oxygen saturation in retinal vessels. The map is generated automatically by the oximeter.* ***B)*** *Visual field image.*

The mean visual field defect was evaluated in relation to oxygen saturation of hemoglobin in corresponding retinal blood vessels.

## Results

Figure 3 shows correlation of visual field mean defect with oxygen saturation for all individuals (n=45). The slope of a regression line for arteriovenous difference was -0.33 %/dB, for venules it was 0.28 %/dB and -0.056 %/dB for arterioles. Deeper visual field defects are correlated with smaller arteriovenous difference in oxygen saturation (r=-0.42, p=0.0037, n=45). Oxygen saturation in retinal venules increased significantly as the visual field mean defect deepened (r=0.36, p=0.015), whereas saturation in retinal arterioles remained constant (r=-0.12, p=0.43).

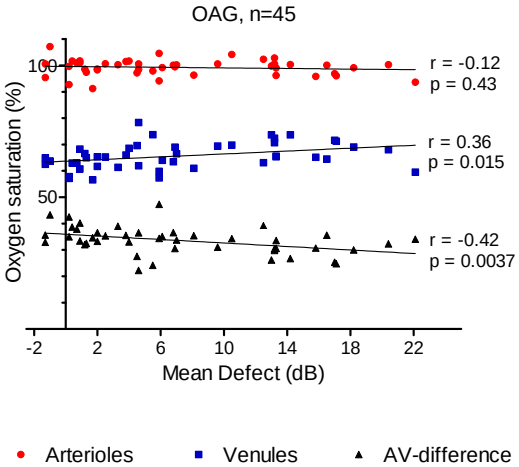


***Figure 3.*** *Correlation of visual field mean defect with oxygen saturation in arterioles, venules and arteriovenous difference in eyes with open-angle glaucoma, with or without PEX. n=45.*

Figure 4 shows correlation of visual field mean defect with oxygen saturation. Significant correlation was found in individuals with open-angle glaucoma without PEX but not in individuals with open-angle glaucoma with PEX.

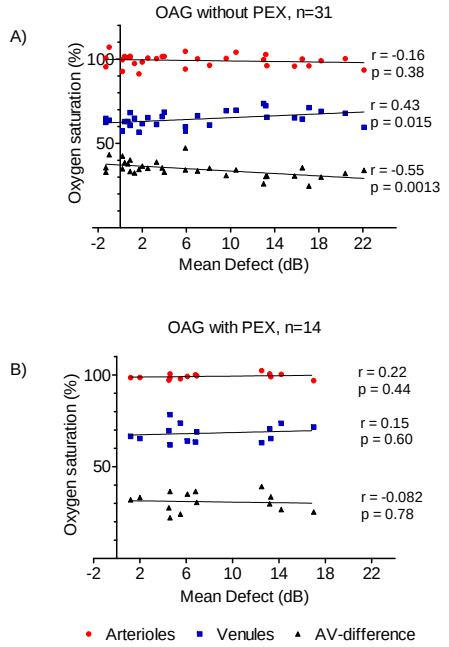


***Figure 4.*** *Correlation of visual field mean defect with oxygen saturation in arterioles, venules and arteriovenous difference in* ***A)*** *open-angle glaucoma individuals without PEX (n=31) and* ***B)*** *open-angle glaucoma individuals with PEX (n=14)*

## Conclusions

Deeper glaucomatous visual field defects are associated with decreased arteriovenous difference in retinal oxygen saturation, possibly indicating decreased oxygen delivery to the retina. These data suggest a change in oxygen metabolism in the glaucomatous retina, possibly related to tissue atrophy.

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