380 Retinal Oxygenation in Patients With Central Retinal Artery Occlusion

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Purpose

The purpose of this study was to measure oxygen saturation in retinal blood vessels in patients with past or present central retinal artery occlusion.

Methods

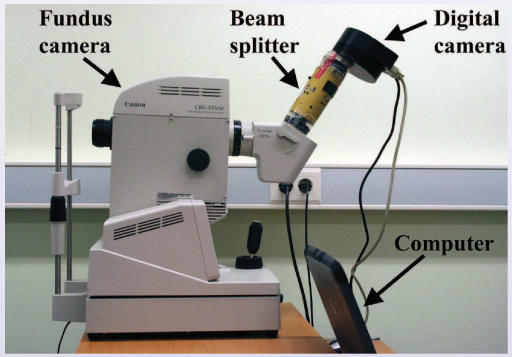


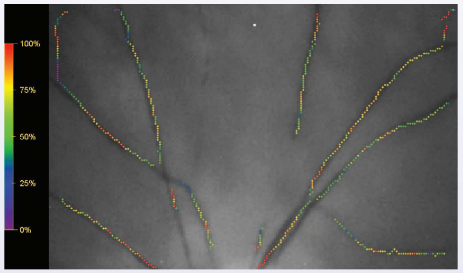
Figure 1. The retinal oximeter.

Our automatic retinal oximeter [1] is based on a fundus camera. It yields fundus images with four wavelengths of light simultaneously. Two wavelengths, 605nm and 586nm, are used for calculation of oxygen saturation. Specialized software automatically selects measurement points on the oximetry fundus images and estimates the oxygen saturation in retinal vessels.

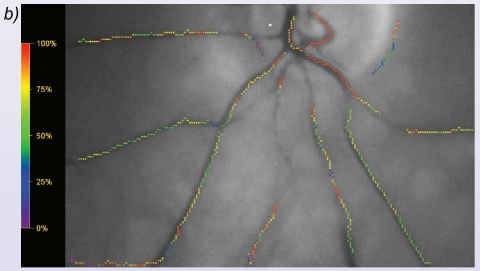
Oximetry was performed in first and second degree retinal vessels in five patients with one day to one month history of CRAO.

Results

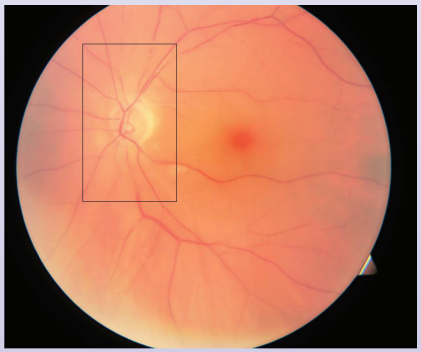
a)



b)



c)



Figures 2a-c. A patient with one day old CRAO. The pseudocolor maps (a and b) show the relative oxygen saturation in retinal vessels, which is similar in arterioles and venules. The fundus image (c) shows boxcaring, which indicates obstructed blood flow.

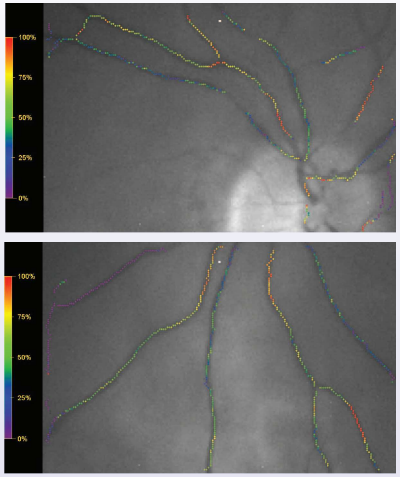


Figure 3. A patient with one day old CRAO. The pseudocolor map indicates low oxygen saturation in retinal arterioles and venules (compare with figure 4 below).

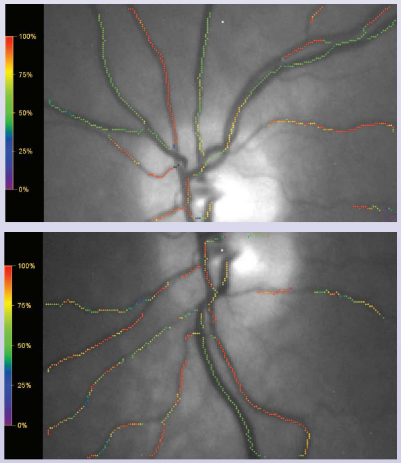


Figure 4. A patient with approx. two weeks history of CRAO. Bloodflow was at least partly restored. The pseudocolor map indicates close to normal saturation.

Table 1. Oxygen saturation in five patients with a history of CRAO (one patient measured before and after treatment). Mean saturation for retinal vessels in each eye ± SD. One to six first and second degree vessels measured in each eye.

	Affected eye		Unaffected eye	
Patient no.	Arterioles	Venules	Arterioles	Venules
1: 1 day history, with boxcaring (figure 2)	71±9%	63±9%	95±5%	66±8%
1 (again): After treatment for temporal arteritis	100±4%	54±5%	100±4%	60±6%
2: 1 day history (figure 3)	82±7%	34±12%	85±3%	49±17%
3: Approx. 1 month history	101±4%	64±8%	99±6%	60±11%
4: Approx. 2 weeks history (only one affected arteriole measurable).	93%	49±6%	97±7%	51±5%
5: Approx. 2 weeks history (figure 4)	104±9%	57±2%	96±3%	70±8%

Discussion

Measurements on two patients with one day old CRAO (figures 2 and 3) show lower than normal [1] saturation. The patient in figure 2 had temporal arteritis and very little retinal blood flow, if any, in the affected eye. In this eye, the retinal arterioles have similar oxygen saturation as venules, presumably because the only source of oxygen is the choroid and the stationary retinal blood simply equilibrates with the tissue. When blood flow was restored in this eye after prednisolone treatment for temporal arteritis, the oxygen saturation returned to normal but vision did not (light perception). Close to normal saturation was seen in three patients with two weeks to one month history of CRAO (patients 3-5 in table 1).

Conclusions

Measurements on five cases with variably long history of CRAO indicate that retinal vessel oxygen saturation is initially decreased but may reach normal values after restoration of blood flow. Cell death, indicated by permanent vision loss, will decrease oxygen consumption and influence the saturation values.

1. Hardarson, S.H., A. Harris, et al. (2006). "Automatic retinal oximetry." Invest Ophthalmol Vis Sci 47(11): 5011-6.

Commercial relationship:
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