Retinal Vessel Oxygen Saturation in Healthy Individuals

**Purpose**

To determine the effects of age and gender on oxygen saturation in retinal vessels of healthy eyes.

**Methods**

Mean oxygen saturation of hemoglobin was measured in retinal arterioles and venules of 120 healthy individuals, aged 18-80 years. Of the 120 participants, 44 (37%) were males (median 49 years) and 76 (63%) females (median 44 years).

The Oxymap T1 retinal oximeter (Oxymap ehf., Reykjavik, Iceland) is composed of a fundus camera, beam splitting optics with light filters and two digital cameras.

The oximeter simultaneously yields two images of the same area of the fundus, one with 570nm light and one with 600nm. Calculated light absorbance is used to estimate hemoglobin oxygen saturation. Vessel diameter is also measured.

The oxygen saturation in the 120 eyes was in retinal arterioles \(92.2 \pm 3.7\%\) (mean \(\pm\) standard deviation) and in venules \(55.6 \pm 6.3\%\). The arteriovenous difference was \(36.7 \pm 5.4\%\).

**Results**

The retinal arterioles and venules in males and females.

- For every 10 years of age, oxygen saturation in retinal arterioles decreases by approximately 2.0\% in males and 0.8\% in females.
- There is no change in retinal oxygen saturation with age.
- Arteriovenous difference increases with age for both genders, indicating greater proportional oxygen extraction with increasing age.
- For every 10mmHg increase in ocular perfusion pressure, oxygen saturation increased by approximately 0.9\% in arterioles and 1.2\% in venules.
- The study provides normative data for retinal oximetry in a Caucasian population.

**Conclusions**

- For every 10 years of age, oxygen saturation in venules decreases by approximately 2.0\% in males and 0.8\% in females.
- There is no change in arteriolar oxygen saturation with age.
- Arteriovenous difference increases with age for both genders, indicating greater proportional oxygen extraction with increasing age.
- For every 10mmHg increase in ocular perfusion pressure, oxygen saturation increased by approximately 0.9\% in arterioles and 1.2\% in venules.
- The study provides normative data for retinal oximetry in a Caucasian population.

**Table: Multiple linear regression for (a) arterioles and (b) venules:**

<table>
<thead>
<tr>
<th>Variable</th>
<th>(a) Arterioles</th>
<th>(b) Venules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>58.8 (x)</td>
<td>53.7 (x)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>-0.057 (x)</td>
<td>-0.20 (x)</td>
</tr>
<tr>
<td>Gender (males=0; females=1)</td>
<td>-0.66 (x)</td>
<td>-1.32 (x)</td>
</tr>
<tr>
<td>Smoking (Non-smoker=0; Smoker=1)</td>
<td>-1.30 (x)</td>
<td>0.17 (x)</td>
</tr>
<tr>
<td>Finger pulse oximetry (%)</td>
<td>0.31 (x)</td>
<td>0.71 (x)</td>
</tr>
<tr>
<td>Ocular perfusion pressure (mmHg)</td>
<td>0.094 (x)</td>
<td>0.12 (x)</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.094</td>
<td>0.075</td>
</tr>
</tbody>
</table>

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