Evaluation of ocular surface temperature in patients with glaucoma

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Purpose:
Glaucoma pathogenesis is multifactorial and not yet well understood. Ocular hypertension is the main risk factor for the development and progression of primary open angle glaucoma (POAG). 1,4 In patients with POAG, changes in retrobulbar haemodynamics are correlated with a progression in functional damage. Some studies showed a correlation between ocular surface temperature (OST) and ocular blood flow. 5,6 The purpose was to assess the impact of glaucoma related parameters on the OST.

Patients and Methods:
In this prospective, single-center study 20 eyes of 20 subjects (7 male; 13 female) with POAG (age 57.3 ± 16.5 years) were included. Ocular surface temperature (OST) was measured by the Ocular Surface Thermographer TG-1000 (Tomey, Japan). OST was measured every second for 10 seconds immediately after blinking. We measured the temperature central, at 3 (temporal) and 9 (nasal) o’clock positions inside and outside the corneal limbus (Fig.1). The parameters considered in patients with glaucoma were ocular pulse amplitude (OPA) measured with dynamic contour tonometry (DCT, PASCAL®), intraocular pressure (IOP) measured with Goldman tonometry, blood pressure (mmHg) measured according to Riva Rocci on the ipsilateral arm of the examined eye, cup disc ratio (CDR) by Heidelberg retina tomography (HRT) and mean defect (MD) in visual field examination by Octopus visual field analyzer (program 30-II). Statistical analysis was performed using, SPSS 18.0 (SPSS, USA). The correlations were tested by means of Pearson’s correlation coefficient.

Results:
Mean OST measured inside the corneal limbus was 33.4 ± 1.1 °C / 33.5 ± 1.1 °C / 33.8 ± 1.9 °C centrally/temporally/nasally. Mean OST measured outside the corneal limbus was 33.9 ± 1.1/ 33.4 ± 1.1 °C temporal / nasal (Fig. 2). Central corneal and scleral OST measurements were negatively related with the age of the patients (p<0.01 Fig. 3). Scleral OST (nasal and temporal) was negatively related with the cup disc ratio (p<0.05) (Fig. 4). There was no correlation with IOP, blood pressure, OPA and MD (p>0.05).

Conclusion:
Cup disc ratio seems to be related with the ocular surface temperature in patients with glaucoma. Ocular surface temperature measured by the non-invasive Thermographer TG-1000 might be an indirect marker of impaired optic nerve perfusion.

References:

Figure 1. The center of the cornea (C) was defined as a circular area at the optical axis of the eye. A horizontal line was drawn through the center of the cornea extending to both canthi. The intersection of the horizontal line and the nasal and temporal corneal limbus were designated as points N and T. The Points NS and TS were the scleral regions on the horizontal line through the center of the cornea. The surface temperature was recorded over each region and an average value for each region was calculated.

Figure 2. Mean corneal and scleral ocular surface temperature immediately after and during ten seconds of eye opening. Mean ± standard deviation values at the corneal center and at four peripheral points measured inside and outside the corneal limbus (temporal, nasal) are presented.

Figure 3. Correlation between mean ocular surface temperature (OST) and age.

Figure 4. Correlation between mean ocular surface temperature (OST) and cup/disc ratio (CDR).