Research Paper

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Weather and eye – review-article

Medical Science

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ABSTRACT

The paper points out the role of direct and indirect action of weather and climate elements on eye pathology. Meteorological factors may act isolated or as components of a weather complex situation, in association with other individual meteorological factors.

Consequences of such factors or complex situations on the eye may lead to functional disturbances and morphological changes, followed by transitory abnormal phenomena or irreversible lesions, expressed as eye diseases.

The authors consider of interest an overview of this topic, as a possible future mean of preventing such pathology.

The weather and climate elements act directly on the eye, generating some diseases in posterior pole of the eyeball, such as solar retinopathy. The solar retinopathy results as a thermal and photochemical damage of the blue light cone cells, described by Groth, and occurring especially during aero-nautical activity.

Weather and climate elements, as components of the environment, act not only directly, but also indirectly, by means of changes of tonus of the autonomous nervous system, endocrinological variations, local tisular metabolism changes, etc.

Such mechanisms cause different eye diseases, such as: retinal detachment, occlusive syndromes of the retinal blood vessels, hemorrhages at same level, ophthalmic migraine, all these mainly as a consequence of variations in blood vessels tonicity.[5,6,13]

The atmosphere electricity may cause burns, which can determine, less frequently, choroid and retinal damages.[11] Papillae and retinal edema, macular edema with macular holes, chorioretinitis, blood vessels damages associated with exudates and hemorrhages, may be any of them, consequences of "atmosphere electricity". This environment element may also cause optic neuritis, optic nerve atrophy, eye extrinsic paralysis, nystagmus and visual field disturbances.

Radiation burns most frequently are caused by ultra-violet rays exposure, in case of extended sunlight exposure. This radiation is almost entirely absorbed by the cornea, but a small amount is absorbed by the crystalline lens and some of it may also cross it, toward the retina.

The infrared part of the electromagnetic radiation spectrum is placed between visible light and short length waves**.** [10] The infrared radiation crosses by the cornea and the crystalline lens and focuses on the posterior pole of the eye; thus, it may cause a special type of chorioretinitis, called solar chorioretinitis.

The severity of the damage depends upon the radiation intensity, duration of exposure, pigmentation degree of the retina. It also depends, upon the refraction state of the exposure eye-emetropia or uncorrected ametropia; and upon the crystalline lens state. This kind of injury occurs seldom. After prolonged sunlight exposure, but more frequently after having watched a sun eclipse without adequate protection. In less severe such chorioretinal damages, there are post images which may take only a few seconds and then disappear.

In more severe cases, the subjects perceive an intensely blurred vision, with the aspect of a cloud which progressively shrinks, becoming a dark spot. This spot represents a scotoma; which may persist for weeks, months or during the entire lifetime.

The visual acuity of such patients decreases, with values between 50% and 10% from normal central vision. The immediate vision reduction may be permanent, but sometimes the visual acuity may recover. The aspect of the fundus of the eye may appear normal sometimes, even in presence of important functional impairments. More often, less severe solar chorio-retinitis causes a duller aspect of the fovea centralis, with a darker shade of the macula. [12] The severe cases are characterized by some grey macular edema, of variable degrees, surrounded by some dark colored ring. This edema evolutes either toward a retinal scar, surrounded by some pigmentary deposits, either toward a macular pseudo hole. [3, 4]

There is no therapy, unfortunately, for such damages. Public education for prevention and warnings before the sun eclipses would eliminate this kind of accidents.

The weather factors are also known to be corrected to some vascular pathology, including involvement of the eye. Thus, retinal thrombosis occur more often during cold months, compared to intermediary or warm months; during the same cold periods, compared to intermediary or warm months; during the same cold periods, the blood pressure, blood viscosity and plasmatic fibrinogen are increased. [2]

Sunlight, as an environment factor, has also a strong involvement in retinal pathology. Sunlight exposure is generally accepted to be harmful in hereditary degenerative pigmentary retinopathies, by accelerating the progression of the disease. It is mainly incriminated the blue component of the sunlight spectrum.

Weather elements, mainly changing weather, have also an obvious influence in ophthalmic migraine. Ophthalmic migraine represents a rare form of vascular headache, primitive or essential. This type of migraine is individualized from common migraine by the headache phase being preceded of visual disturbances, frequently of characteristic repetitive aspect.

The weather factors also cause functional changes in the eyes, such as increase of darkness adaptation speed and the decrease of papillary light reflex in a cold environment and under high atmospheric pressure.

The atmosphere pressure may also induce ocular changes. The pressure may act individually or as component of a weather complex situation, in association with other individual meteorological factors. [9] Individually, atmospheric pressure acts at high altitude; there, the reduction of the air pressure (on the mountains, in the airplanes or skydiving), hypoxia causes a decrease of visual acuity, especially in near vision, accommodation disturbances, and improper vision in dim light may determine

a reduction of visual field, starting from 5000m. The oculomotor stability state is also very hypoxia sensitive (Bietti). A subject which is ortophoric at sea level becomes esophoric at 4000m; in the meantime, an esophoric notices the increase of his degree of heterophoria. This decompensation may lead to diplopia. A good altitude adaptation reduces these phenomenons. As component of a weather complex situation, the air pressure induces functional disturbances of the eye; thus, darkness adaptation is faster during cold air masses penetration, characterized by high air pressure, low temperature and rich oxygen content. The same darkness adaptation is slower during warm masses penetration.

Sun light exposure presents some particulars depending on altitude, particulars which become more effective especially in aeronautical activities. The sun generates a polyvalent radiation, which is transformed while crossing the atmosphere. [1] The existence of the ozone, water steam and carbonic gas layers determines the different absorption of rays, depending upon the wave length. [7]

The role of these wave lengths, the genesis of certain cataracts was discussed, but it seems this etiology must not be retained, because of short exposure time of the pilots. [8]

However, at high altitude pilots some pigmentary reshuffles have been noticed, maybe as a consequence of infrared rays influence.

Chronicle light exposure seems to increase the risk of appearance of subretinal neovascularization, which causes age-related macular degeneration. Intense light exposure also determines wider or smaller central scotoma, which takes longer, but usually disappears in time, color vision loss and stereoscopic vision damage. Thus, light has an active influence on the eyes physiology and health state.

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