“Burned eyes” - the dangerous look at our sun

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After the partial solar eclipse of 1996 October 12, about 20 patients were examined at the Ludwig-Maximilian-University Eye Hospital in Munich during the following week, all complaining about the same defect: When reading text, they missed single letters. These mostly younger people underestimated the danger in spite of many warnings in public media and observed the event without adequate protection. It took mostly some seconds for them to recognize the sickle-shaped form of the sun. The size of the lesions varied according to the duration of the unprotected exposure causing losses from one to three letters.

This article is thought as warning to observers of partial and total solar eclipse, next on 2009 July 22, visible in Eastern Asia: **Don’t look toward the sun without adequate protection of your eyes!**

Visual acuity and normal seeing is the result of light passing the cornea, lens and vitreous body to be focused on the retina. These transparent structures built an optical system. In case, that sun light is passing through, this optical system functions as a burning glass. The heat destroys the retina locally. This part, the middle of the retina, called macular region, is responsible for fixation and reading, recognizing forms and colours.

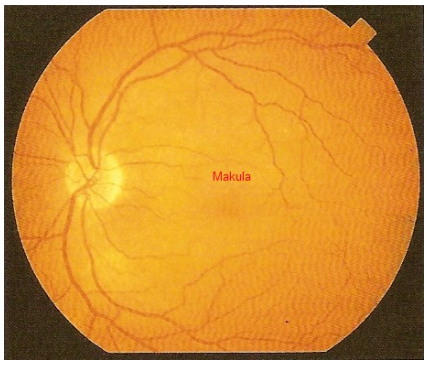

Figure 1: Normal retina of a human eye. Blood vessels can be recognized very easily and lead to the eye nerve seen as a bright circle. The macular region looks a little bit darker in the center of the picture.

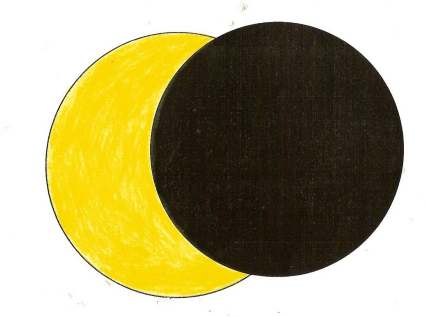

Figure 2: partial solar eclipse October 12, 1996, 15:31 MEZ in Munich

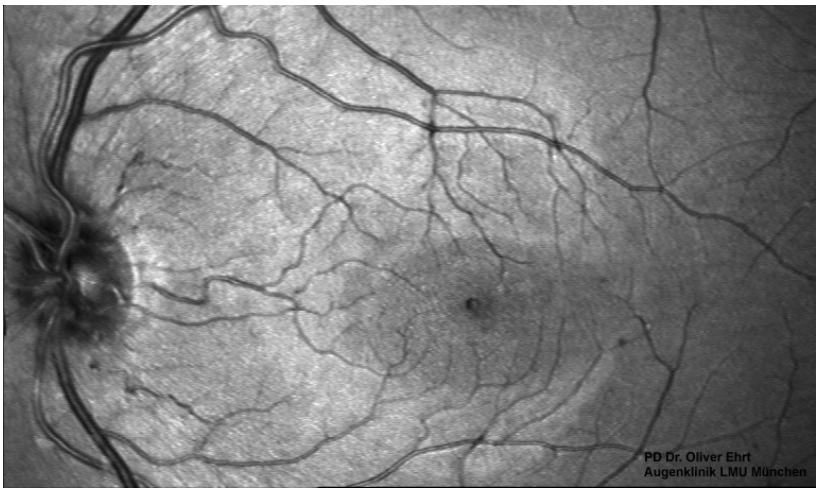

Figure 3 shows the damaged central part of the retina, which looks very similar to the form of the partial solar eclipse on October 12th, 1996.

The patients (13 female, 7 male, age 15-46 y) suffered from acute solar retinopathy and described minute deficiencies (scotomas). They were consternated about the loss of one to three single letters in their central visual fields. Every patient underwent a special diagnostic test of the central part of his retina with the scanning laser ophthalmoscope (SLO, Rodenstock). With this method, called microperimetry, the examinator can put little stimuli (Goldmann I, 0.11°) seen as little points in a 20° field of the retina, seen very clearly on a screen. The scotoma size and threshold sensitivity at the retinal lesion were measured with this procedure within the first 10 days after exposure. Furthermore we recorded the reading quality by testing the saccades and speed while reading a 7 lines text. Follow-up examinations were carried out after 1 and 6 months. Some of the patients were checked again 2 years after the event.

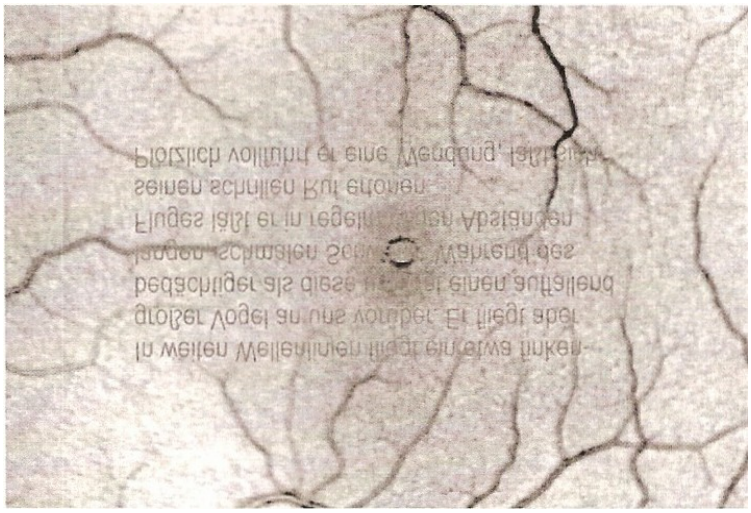

Figure 4: Projection of the reading text in newspapers size letters on the center of the retina. The patient is just fixing the center of the text, which appears on the retina in mirror writing upside down. The visual lesion has the size of 3 letters.

One young woman reported reading “S lad” and “Piz a” on the menue, when visiting an Italian restaurant after having watched the eclipse. She got very concerned and full of irritation. This phenomenon is verified by creating maps of the visual field.

Our results showed that 31 eyes were affected (9 patients unilaterally, 11 bilaterally). 4 eyes showed anatomic changes on imaging but no functional impairment. Visual acuity was 0.8 (20/25) to 1.2 (25/25 or more) in 28 eyes, but reduced within 0.16 (20/125) and 0.5 (20/40) in 3 eyes. Normally visual acuity is 1.0 (25/25) or better, but we didn’t know if our patients had normal visual acuity before. But in all eyes with subjective impairment scotomas were detected.

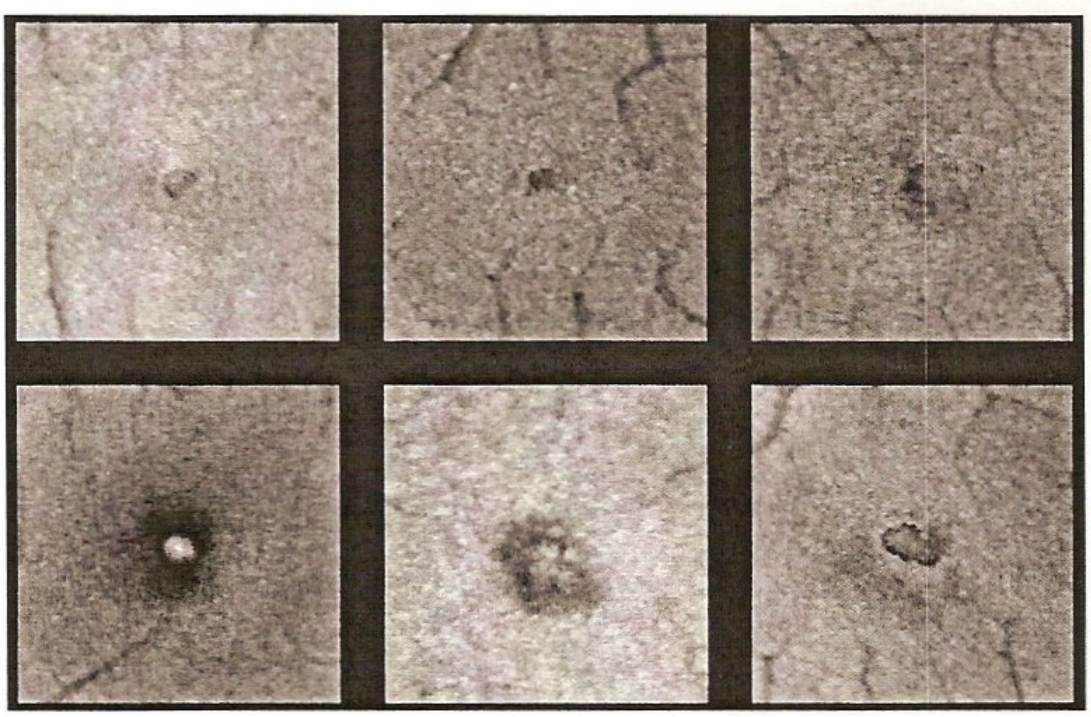

Figure 5: Some typical results of the fundusscopic pictures at first representation. The pictures were taken with the HeNe laser of the scanning laser ophthalmoscope (SLO). On the **upper left side** the form of the solar eclipse can be recognized very clearly: a semicircular lesion caused by the moon. On the **upper right side** discreet changes of the pigment epithelium without functional lost. **Middle lower side**: The patient had used his camera with a telephoto lens, that’s why the lesion seems to be increased on the retina. This effort he paid for with an irreparable damage of his leading eye.

The results of these examinations were presented by the eye specialist Dr. med. Oliver Ehrt at a congress of German eye specialists and were published in German and English special ophthalmological papers. Furthermore he forwarded the results to the Munich observatory to demonstrate the consequences of observing the partial solar eclipse without adequate protection. Retinal damages are to be expected when using inadequate filters as exposed films, soot- blacked glasses, foil-rescue-blancets, CD’s or even a welding mask.

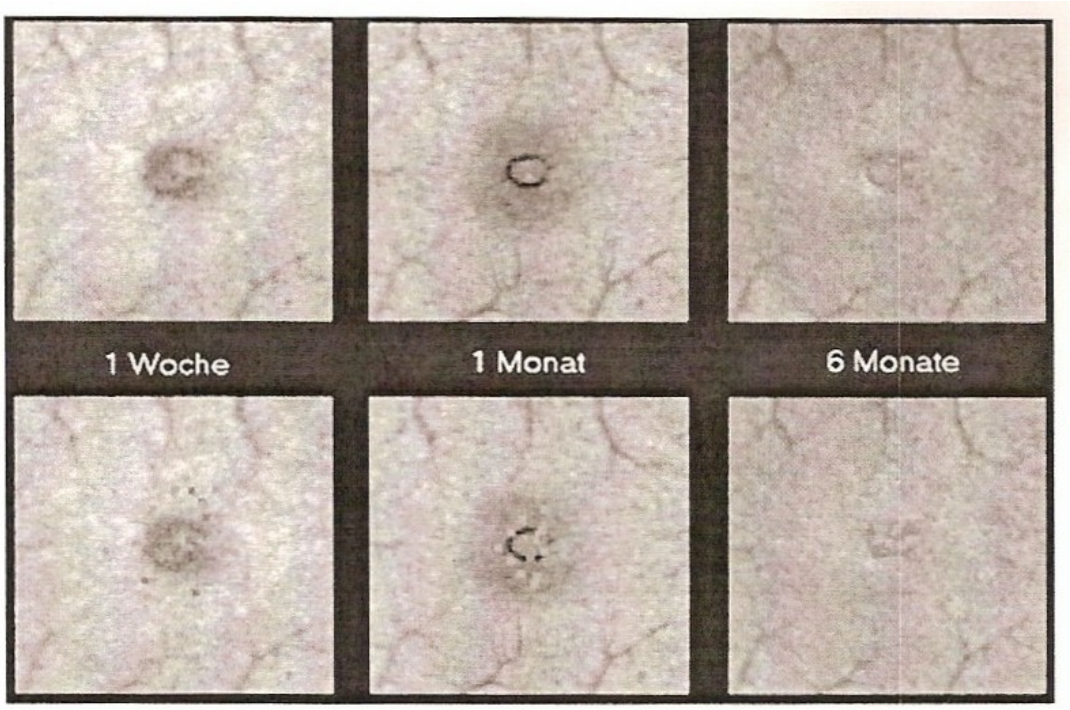

Figure 6 shows the results after one week, one month and six months. The upper part shows that the retinal lesions got smaller within six months. In the lower part black points indicating that stimuli were not seen at these locations of the retina changed into white points meaning that stimuli were seen now. During one month all eyes showed functional improvement even in cases where patients subjectively were not able to recognize the better situation.

Therefore in every observatory with a good assortment, in astro- and optics-shops there are glasses available with special foils so called Baader-foil. Sometimes even amateur astronomers are too careless, in their enthusiasm and desire to make impressive photographs. Normally nobody has ever seen a damaged retina until it happens to himself. I hope that this documentation with the impressive medical pictures will help to reduce the number of patients.

Special thanks to Hans-Georg Schmidt, Dr. Klaus Nagel and Bernd Gährken, members of the Munich public observatory for their friendly support. Springer – medical publishers, rights and permission – allowed me to republish the pictures and legends in astronomical papers.

Literature

Figures 3 to 6: O. Ehrt, I. Tavcar, G. Eckl-Titz. “Microperimetry and reading saccades in solar retinopathy. Follow-up study with the scanning laser ophthalmoscope.” Der Ophthalmologe, Vol. 96, No 5 /May 1999 published by Springer.

Figure 1: Textbook. Augenheilkunde. Lehrbuch. Franz Grehn, Wolfgang Leydhecker. P. 164, © Springer-Verlag 1995, ISBN 3-540-59296-2, 26. Auflage.

Figure 2: Picture of the partial solar eclipse October 12, 1996, 15:31 MEZ in Munich, generously reconstructed by the members of the Munich observatory.