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CATARACTS FOLLOWING USE OF A MICROWAVE OVEN

A CASE REPORT

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fig 2

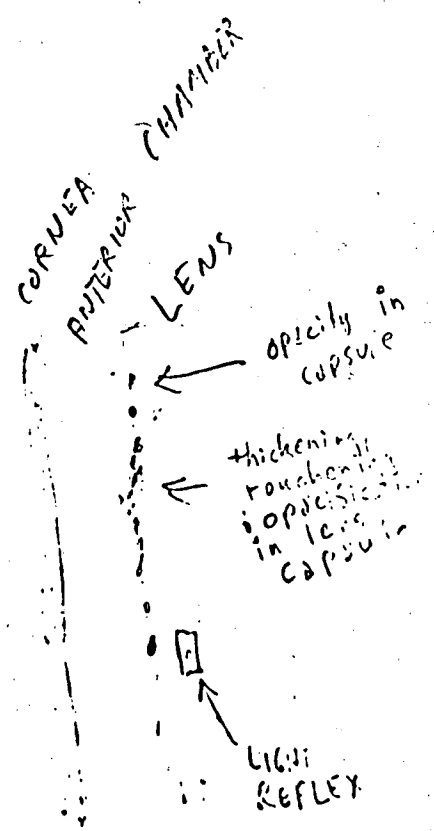


fig 3

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A well known delayed appearing adverse effect of exposure to hertzian radiation is cataract formation. 1-5 Although the maturation time for any type of cataract may be shortened by nonionizing radiation exposure, occasionally following repeated, low-level exposures and a latency measured in months to years, a unique type of cataract occurs. It has the distinctive feature of taking origin in the capsule (an elastic membrane that surrounds the lens substance) rather than in the lens substance itself where practically every other type of cataract (such as congenital, hereditary, metabolic or senile types) originates. If the patient is examined by slit-lamp biomicroscopy or stereo-photography before the cataract is fully mature, it is frequently possible to distinguish capsular cataract from all other types. However, it is not common practice for ophthalmologists to search specifically for the microscopic distinctive features because capsular opacification is so rare that very few ophthalmologists have had experience in its diagnosis. Instead, it is usually reported as subcapsular opacification.

When the specific portion of the hertzian spectrum responsible for the capsular cataract can be identified, such as following infra-red or microwave irradiation, then the condition may be referred to as an infra-red cataract or a microwave cataract as the case may be.

Case Report

Mrs. B.L., a normally developed, well nourished, 51 year old, white, female housewife was examined on February 23, 1973. The reason for examination was to

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obtain an opinion regarding the etiology of her cataracts.

Family history of eye disease disclosed that her father and a paternal aunt had developed senile cataracts late in life.

Personal history was one of general good health and absence of ocular complaints until February 1961 when the patient noticed that her near vision was becoming blurred. Examination revealed that the unaided distance vision was 20/25 for the right eye and 20/20 for the left, that the patient had a negligible degree of farsightedness which did not require the prescription of distance glasses but that she was developing presbyopia which was corrected with +1.00 diopter spherical lenses O.U. as reading glasses. The cornea, anterior chamber, iris and pupillary reactions, lens and retina of both eyes were examined and found to be physiological.

The next significant eye examination was performed in June 1969, at which time her chief complaint was an increasing sense of blurred vision of the right eye which had begun during the previous twelve months. Examination revealed that the visual acuity could be corrected to 20/20 in the right eye and 20/15 in the left and that incipient opacities were forming at the posterior subcapsular area of both eyes, being more pronounced in the right eye than the left.

Examination in March 1972 revealed that the best visual acuity was 20/70 for the right eye and 20/50 for the left eye in a refraction room with subdued illumination. The patient complained that her vision was impaired further with the higher levels of ambient illumination found under normal conditions. Her oph-

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thalmologist found that there were extensive posterior subcapsular opacities with a few opacities and vacuoles in the anterior subcapsular areas of both lenses, the right eye being more advanced than the left.

On April 5, 1972, the patient underwent cataract extraction for the right eye and subsequently the visual acuity of this eye was correctable to 20/15.

In view of the facts that the patient had been in good health throughout her life and that her cataracts were not of a hereditary nor senile type, she and her ophthalmologist sought an etiological factor. The only potential cause that could be incriminated was the microwave oven installed in her home in 1966. The patient was fortunate in obtaining the services of the Radiological Health Division of her home county to test and evaluate her microwave oven for radiation leakage. In September 1971, the test results indicated that the oven leaked microwave radiation at a maximum level of 2.0 mW/sq cm during operation and 40.0 mW/sq cm when opening the door. The test was repeated in November 1972 at which time the oven was reported to be leaking microwaves at a level of 1.0 mW/sq cm during operation and 90.0 mW/sq cm when opening the door. The essential findings of my examination of the patient's eyes were as follows:

Right Eye.

The right eye was aphakic; the surgery appearing to have been a round pupil, intra-capsular cataract extraction combined with peripheral iridectomy. Visual acuity was easily corrected to 20/20 for distance and Jaeger #1 print for reading.

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Left Eye.

The vision of the left eye was 20/80 correctable to a faulty 20/50. No lens could improve the near vision well enough to permit reading ordinary test print. The remainder of the findings for the left eye were physiological except for the lens which exhibited an advanced stage of capsular cataract involving the posterior region of the capsule more than the anterior. At the posterior surface of the lens, in addition to extensive capsular opacification there were also many regions where the contiguous lens cortex was also opacified giving rise to multiple areas having a honeycombed appearance. Although the process had also extended to encompass the anterior capsule, in this location the pathology was at an earlier stage exhibiting extensive capsular opacification with a few scattered opacities and vacuoles contiguous with the capsule.

The photographs demonstrate a normal lens in Fig. 1 and this patient's left lens in Fig. 2. Inspection of Fig. 2 reveals a few areas having the typical honeycombed appearance of microwave cataracts as found in radar trouble-shooters. The principal volume of the lens substance which contains the opacification in other types of cataract is completely transparent in this case. Each of these photographs is taken from a stereo pair. When Fig. 2 is stereoviewed with its mate, the anterior capsular opacification can be recognized readily as well as the fact that what cortical opacification is present is itself contiguous with opacified posterior capsule. Fig. 3 is a slit lamp photograph demonstrating roughening, thickening and opacification of the anterior capsule.

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Impression.

- (1) Microwave cataract of left eye.
- (2) Aphakia of right eye, presumptively this cataract was also a microwave cataract.

Discussion.

This is the first reported case of microwave cataract where the patient's exposure was not relatable to an occupational environment or a therapeutic application of microwave radiation. Instead, the evidence clearly indicates a faulty consumer product to be the exposure source.

In addition to the distinctive capsulopathy, the other features in this case - such as repeated covert exposures, latency of months to years and subsequent slow spread of the cataractous changes both by extension to involve increasingly larger areas of capsule and by opacification of lens substance which begins at its peripheral surface contiguous to sites of capsule injury and later spreads to deeper regions - are all typical of microwave cataracts.

Although definitive data cannot be extracted from a retrospective exposure history in this specific case at this particular time, nevertheless the following estimates may be of some value. During the period prior to the appearance of signs and symptoms of early cataract in 1969, the patient used the microwave oven for a total of about 500 hours, opening its door approximately 5,000 times. Subsequently, until the oven was found to be faulty in 1971, she used the oven for about 350 hours and opened the door about 3,500 times.

Legends for Illustrations

- Figure 1. Photograph of the pupil in a normal eye. Only the flashlamp light reflex is seen against the black surround which is the appearance of a normal lens.
- Figure 2. Photograph of the pupil in the housewife exposed to a leaky microwave oven, depicting microwave cataract. Here, in addition to the light reflex, the center half of the pupil can be seen to exhibit varying degrees of incomplete opacification.
- Figure 3. Slit lamp photograph of the case reported. Roughening, thickening and opacification of the anterior capsule of the lens (wide structure) can be recognized as a slight projection into the anterior chamber (optically empty) towards the cornea (narrow structure).

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References

1. Daily L Jr, Wakim KG, Herrick JF, Parkhill, EM: Effects of microwave diathermy on the eye. Am J Physiol 155:432, 1948.
2. Richardson AW, Duane TD, Hines HM: Experimental lenticular opacities produced by microwave irradiations. Arch Phys Med 29: 765-769, 1948.
3. Hirsch FG, Parker JT: Bilateral lenticular opacities occurring in a technician operating a microwave generator. Am Med Assoc Arch Ind Hyg 6:512-517, 1952.
4. Shimkovich IS, Shilyaev VG: Cataract of both eyes which developed as a result of repeated short exposures to an electromagnetic field of high density. Vestn Oftalmol (Moscow) 72:12-16, 1959.
5. Zaret MM, Kaplan IT, Kay AM: Clinical microwave cataracts. Symposium Proceedings - Biological Effects and Health Implications of Microwave Radiation BRH/DBE 70-2: 82-84, 1969.