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MALNUTRITION AS AN ETIOLOGICAL FACTOR IN SENILE CATARACT

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To one who has followed the ophthalmic literature of the past several years, it is apparent that there has been a change of attitude concerning the possibility of arresting the progress of incipient cataract.

Berry¹ was the first to believe that the transparency of the crystalline lens was maintained only when no great change took place in its supply of fluids. "The main cause of opacity," he wrote, "appears to be, then, a too rapid abstraction of the fluid from the lens." Ball² contended that "The cataractous lens contains relatively less water and more solids than the non-cataractous lens" and refers to the suggestion of Collins that "Dehydration associated with opacification is in no sense dependent upon changes which are the result of age and has no relation to the 'ordinary senile lens.'" Collins and Mayou,³ in "Pathology and Bacteriology of the Eye," while discussing the question of diabetic cataracts which they believed due to dehydration of the lens, make the statement that where the opacity of the lens has been only of short duration, it has been observed to decrease in amount, or even to disappear altogether as the result of improvement taking place in the patient's general condition.

Fuchs,⁴ in the early 90's, stated that incipient cataract might be due to the abstraction

from it of water and cited as an illustration that cholera patients, in late stages, go blind from a drying out of the crystalline lens. He noted that a frog placed in salt water soon developed cataract because of the salt extracting the water from its crystalline lenses. He observed, however, that such cataracts cleared up in a short time when the frog resumed his place in fresh water. This suggestion of Fuchs' seemed to have impressed Sir Stuart Duke-Elder,⁵ who, some 40 years later, in *Pathogenesis of Cataract*, observed that "Apart from this the salt concentration will have osmotic effect causing alteration in the fluid traffic between the lens and the aqueous. . . ."

Carter⁶ was the first to suggest that "There are undoubtedly certain forms of cataract such as those due to malassimilation in which peripheral strias are present in the lens" and "There can be no doubt that under the influence of a suitable diet and regimen such a person may preserve his eyesight just as he will preserve his life longer than he would if he continued in his unphysiological course." Later, DeSchweinitz⁷ wrote: "The etiology of cataract is by no means clear" but "often there are extraocular reasons and the cataract results from nutritive causes."

Davis, long a teacher of ophthalmology in The New York Postgraduate Medical School (Columbia University), stated specifically that senile cataract is often due to a lack of sufficient and pure food, and said: "It is most important, therefore, that senile cataract . . . be diagnosed early and the patient treated

as well as the disease." Park Lewis who did much to establish the nitrate of silver treatment for the prevention of ophthalmia neonatorum refers to "The premature senility of natives of India whose lowered vitality, due to food deficiency . . . is associated with a proportion of cataract greater than that found elsewhere in the world" and concluded that there must be a causative relation between these depressing conditions and the lack of native Indian nutrition.

JUST WHAT IS SENILE CATARACT?

Formerly, it was thought that senile cataract was a change in the crystalline lens which had been brought about by aging. This idea went unchallenged until a number of observers noted that lens changes, masquerading under the name of senile cataract, often made their appearance much earlier in life than the age of the patient would indicate, and that similar changes were sometimes absent in extreme old age. Why then was this? The answer came with Stieglitz who determined that so called aging may come on at any time it being due to a breaking down of cells after which an accumulation of extra-cellular material soon fills up the spaces previously occupied by functioning cells. Nearly all gerontologists have accepted this conclusion as one which agrees with their own studies. This law of senile change may be observed in the striations, fissures, clefts and vacuoles of most cataracts regardless of age.

Fox⁸ was the first to contend that cataract was due almost exclusively to a destruction of the lenticular fibres by breaches or "vacuoles" in the lens. Sir Stuart Duke-Elder⁹ stated that coming down to our own time "In the cortex large clear clefts filled with fluid open out the sutures, and vacuolization occurs. At this stage," he wrote, "if an appropriate process can be induced, the vacuoles may be got rid of to a considerable extent and the 'cataract' appears to improve or to dissolve, as is occasionally seen in traumatic or diabetic conditions." To use a homely but appropriate example, anyone familiar with the process of dehydrating cheese, where openings of many forms are established in the substance of the product, may be impressed with the thought that the two sub-

stances, cataract and dehydrated cheese have much in common.

Gullstrand, Koby, Nelson and other world authorities, when the slit lamp was young, drew the conclusion that vacuoles, clefts and open sutures in the lens were caused by an excess of water in the lens. After long observation I believe that the reverse is true and that cataract, rather than being wholly a senile disease, represents a lens starving for nutrition including water in which open clefts, strias and vacuoles form.

THE GENESIS OF THIS STUDY

My attention was first called to the relationship of lack of nutrition and fluids to that of cataract by the occurrence several years ago of the two conditions in the wife of a young physician of Hunt County, Texas. At about the same time, numerous other cases of incipient cataract were seen in young persons who lived in adjacent counties where share croppings largely prevailed. My observation of these patients was that none of them could be considered well nourished. All, including the physician's wife, were accustomed to foods of low nutritive value, corn (maize) with salt pork constituting the bulk of the diet. They consumed little milk, their principal intake of fluids consisting of liberal portions of coffee. No ice was available, water from surface wells was warm and insipid and as a result when possible all refrained from drinking it. I noted that the average diet of the residents of this area consisted largely of biscuits made of refined white flour in which no yeast was used, and of corn bread, to both of which had been added bicarbonate of soda. It is well known that alkalis tend to destroy what vitamins may be left in over-milled flour. It is also known that another factor, the absence of yeast, is provocative of poor nutrition. As a result, an unprecedented number of patients with incipient cataract were seen from this locality.

VITAMINS IN THE TREATMENT OF INCIPIENT CATARACT

A century ago nothing was known of the properties of vitamins. At that time, scurvy had more terror for seamen than did the savage races of unexplored lands. On long

voyages a high percentage of all sailors became scorbutic and died. The slavers lost one quarter of their human cargo from the same scourge. The reason for this did not become apparent until 1885. In that year the clue to this puzzle of history was unraveled by the Japanese who brought to a close the occurrence of wholesale death from beri beri in their navy by substituting rations to their ships' crews of whole rice for their then polished rice. It was not until 1911, however, that Casimir Funk coined the word vitamin to designate certain properties in plant life which he found were life giving when administered in the diet of formerly starved laboratory animals. At about this time Joseph Goldberger of the U. S. Public Health Service did much for the patient with incipient cataract. He insisted that the manner of the milling of maize then in vogue destroyed to a great extent its vitamin content in the same manner as the polishing of rice had been the source of much beri beri in the Asiatic. As a means of overcoming this condition, Goldberger recommended the consumption of large quantities of water and the inclusion in all diets of patients in maize-eating areas of green vegetables, fruit and eggs.

Before 1920, Hess had proclaimed that ascorbic acid (vitamin C) in the form of green vegetables when given to children in the early spring and summer helped these children to make rapid progress physically. His experiments upon laboratory animals proved that, without the addition of foods containing vitamin C, butter fat or egg yolks to cereals, laboratory animals were not capable of normal growth. These observations parallel my own findings in the patients already referred to who came from share cropping districts. Soon after this I began to suggest to my incipient cataract cases the adoption of diets which were rich in vitamin C, namely cabbage, oranges, carrots, tomatoes, rutabagas, turnips, etc. The reason for this was brought home to me by my observation that nearly all my incipient cataract cases were depleted physically and lacked these articles of diet.

There was at that time a general agreement in ophthalmologic literature that the maturation of cataract, from the time of its

incipiency, occupied an average period of about four years. Nearly any modern practicing ophthalmologist of large experience may see by his records that the time is sometimes even less than this and that many of his cataract cases have matured in one year or less. Several patients, whom I then had under observation and who were following a regimen prescribed by me, evidenced little or no progress in the development of their opacities; on the contrary, many of them improved. This was a suggestion to me that cataract was often due to a disturbed metabolism and might be prevented by proper feeding.

CHLOROPHYL VARIOUSLY ADMINISTERED TO PATIENTS WITH INCIPIENT CATARACT

Shortly before this, a great step forward had been made in human nutrition, and, incidentally, in the control of cataract, by Willstätter's discovery of the chemistry of chlorophyll. The belief that green plants had more effect on nutrition than dried plants which had lost their chlorophyll had been common to the human race since time immemorial. The fact that animal life thrives on the green in plants was the common knowledge of all who have seen animals depleted by semi-starvation during the winter take on new life as soon as they were turned out on the tender new grass of spring pastures. The reason for this is simple. The blades of grass are so placed that they absorb the orange, red, blue, and violet rays of the sun. The green in the spectrum is used less than any by the grass blades. The grass looks green to us only because little green is absorbed and therefore is registered on our retinas as this color. In the laboratory it was found that the chemical properties of chlorophyll and hemoglobin are much the same, the chlorophyll formula differing from the formula of hemoglobin only in the fact that in the hub of the hemoglobin molecule an atom of iron is substituted in the chlorophyll molecule by an atom of magnesium. It is a very engrossing fact, as it now appears, in the retardation of cataract that the formula of chlorophyll and hemoglobin are so nearly alike. Willstätter found carotin a type of chlorophyll in the body of fresh carrots, and he suspected that its administration had

a wholesome effect on vision. So far as I know I was the first to prescribe a diet of green tops of garden vegetables to cataract patients and I still find this diet has its advantages in incipient cataract cases.

THE SLIT LAMP IN THE PROGNOSIS OF CATARACT

In the study of cataract the slit lamp has been of immeasurable value to me. By its use I early began to observe in cataractous lenses open fissures, clefts, vacuoles and other abnormalities of the same nature. Behind such opacities the beam of light casts shadows. By the position and length of these shadows the location in the lens of the opacities creating the shadows was easily ascertained. A short shadow, of course, indicates that the opacity responsible for it was in the posterior portion of the lens; a long shadow represented the opposite. Gullstrand and Vogt had already mapped out a working topography for the human lens. This was somewhat simplified by Koby and Butler who have modified Gullstrand's diagrams considerably and have simplified our knowledge of Gullstrand and Vogt's original ideas.

The slit lamp has made it clear that incipient cataract is often an opening out of the normal sutures of the lens. In the literature these openings are usually referred to as open sutures unless they became broad or gaping; they are then spoken of as clefts. They may be seen most often in the cortex. Most authors describe them as being filled with water because by transillumination they often appear perfectly transparent. Years ago I began to suspect that this was not the case. It did not seem logical that they contained water for after the ingestion of liberal quantities of fluids over a period of weeks they were often seen to close. They, therefore, appeared to me to be the result of dehydration of lens tissue. "Clear clefts," says Koby,¹⁰ "appear after fifty years of age, and it seems, a little earlier in women than in men." My observation is that this is true, but I have many times seen them appearing at any age in ill nourished and dehydrated persons. I have noticed that Butler¹¹ in his latest book has affirmed that lamellar separations of the fibres of the adult nucleus contain no fluid. With this I agree.

With the slit lamp the vacuoles in the lens are most often seen lying under the lens capsule. Isolated vacuoles may occasionally be seen in otherwise normal lenses, but usually they have their origin in the separated suture. In many instances, I have seen a diminution in the size of these vacuoles, clefts and fissures in the lens after an adjustment of the diet together with the ingestion of large amounts of fluids. It is very gratifying to me to see in Koby's¹⁰ book, "Slit Lamp Microscopy," just referred to, that in discussing the pathology of the lens, he speaks of "more or less empty clefts and vacuoles." This is the reverse of the opinion most generally held but in agreement with my own observations.

The degree of vacuoles seen in lens tissue may aid us in determining whether or not a lens is apt to repair under a regimen in which the amount of fluid intake is greatly increased and the diet is so ordered that a large amount of chlorophyl and ascorbic acid as well as other vitamins will be assimilated daily. In this respect, the slit lamp aids us in determining the presence of vacuoles that could not be seen by the use of the ophthalmoscope in the living or by any other known method of examination. For this reason, I have for a long period subjected all cases with failing vision, senile or otherwise, to a close scrutiny with the slit lamp and to the degree of clefts, open sutures and vacuolization found I have believed, which belief is borne out by evidence, that a very good estimate regarding prognosis in incipient cataract cases under a proper regimen may be gauged.

GENERAL ROUTINE IN INCIPIENT CATARACT CASES

This routine consists in greatly increasing the patient's intake of fluid which should consist of from 8 to 10 large glasses of water daily in addition to his or her teas and coffees. From a list of the green tops of 6 selected garden vegetables I have them add one as "greens" to the diet daily. Additional water soluble chlorophyl is provided by tablets which when well borne amount to an average consumption of 45 milligrams a day. Some patients take twice this amount. Ascorbic acid (vitamin C) is given in large doses

averaging about 1 gram a day. Units 200,000 of vitamin A are also given daily. No vitamin is contraindicated in incipient cataract cases. Each patient is required to have at least one pint of milk and two eggs daily.

At the present time I have under treatment more than 450 patients with incipient cataract. A number of these have remained incipient over a period of 11 years. I have possibly seen in more than 30 years in the practice of ophthalmology as many cataracts as any ophthalmologist in my section of the country. Formerly, nearly all these cases soon went on to maturation and operation; at this time, only a limited number under observation and treatment have had to submit to surgery. I believe, then, that in a larger percentage of cases than most surgeons have realized is cataract a preventable disease.

SUMMARY AND CONCLUSIONS

A study of the cases cited, and the reviews of well known investigators who have arrived at conclusions similar to mine through a period of some 30 years, points to the conclusion that the regimen herein suggested is effective. Correct regulation of the diet and the fluid intake in patients with malnutrition will retard the progress of their lens changes and may aid in overcoming the defect entirely. A parallel of the results of recovery of an eye disease by feeding alone may be found in children with nyctalopia, the night blindness disappearing completely after administration of vitamin A.

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RARE TUMOR OF THE TONGUE OF NEWBORN CHILD

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The following report is on a Mexican baby, three months of age. The parents stated that immediately following birth, it was noted that the child had difficulty in swallowing and that some type of growth was on the posterior portion of the tongue. The family doctor was consulted when the child was two weeks of age, and he noted a definite growth on the tongue. From this history and observation by a physician, it is believed that this growth was present at birth. The family was in poor circumstances and unable to consider surgical intervention until the child attained the age of three months.

On my examination an elevated growth, approximately one centimeter in length and one-half centimeter in width was noted involving the posterior half of the tongue, located mostly on the right side. Under general anesthesia the growth was removed and found to be invading the muscle structure. The wound was closed with several sutures, and the child appeared to recover normally from the anesthetic. Unfortunately, the baby