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Formation of Cataract.

Read before the Medical Society of the District of Columbia.

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THE RELATION OF GENERAL DISEASE TO THE FORMATION OF CATARACT.

The etiology of cataract may be classed under the following heads: Disease of the eye; diseases, which by some influence, exerted through the blood or the nervous system, interfere or impair the nutrition of the lens; and senile degeneration, certain pathologic conditions within the eyeball, especially of the choroid, are great factors in the production of cataract; yet may not the general or constitutional trouble manifest itself upon the choroid and these changes be secondary to the lowered health condition? The occurrence of cataract after middle life indicates the influence of senile change. It is generally conceded that senility or age exerts a powerful influence in the production of this condition of the lens. Cataract, in opinion of the writer, is not due to age, in the sense as we say that poisoning is due to the poison, or iodism to the iodine; it is senile in the same sense as atheroma of the arteries; it is a condition found associated with age, but all aged persons do not suffer from this condition. Clinical experience teaches us that the so-called senile cataract, after its beginning, is not steadily progressive, but may be marked by a steady increase, or periods of little or no change, and sometimes by a diminution of the opacity. Cases are on record where the patient having an incipient cataract, was told that it would be rapidly progressive; the physician was then informed that six years before the patient had been told the same thing by another ophthalmologist, and that between these times no diminution of sight had occurred, nor was the opacity greater. We frequently meet with cases the etiology of which is obscure, therefore, the causes which orig-

inate the opacity is of importance and of great interest. If the general physician were to become more familiar with the use of the ophthalmoscope, and were to make a careful examination of the media and fundus of the eyes, as one of the methods employed in the study of the symptomatology of general disease, much valuable information could be thus obtained in this direction and the ophthalmologist would then receive valuable data and not be compelled to gather it from scattered reports through the literature, the value of which may be questionable, and may only prove a coincidence; also, he will not have to rely upon the statements of patients in ascertaining all the particulars as to the beginning of the opacity, and as to any history of general disease. Clinic patients are very uncertain and their statements are not always reliable. In the hospitals and clinics the physician and the ophthalmologist serve together in their respective capacities; this would seem to me to be an excellent opportunity to combine their skill in the study and treatment of general diseases from beginning to the end. The information thus gained would be invaluable, and add much to the literature of medical ophthalmology. I have for this reason brought this subject before the Society, hoping that it may be the means of gaining the aid and coöperation of the general physician in our researches along these lines.

I shall now present to you some of the general diseases which seem to have some relation to the formation of cataract.

Malaria.—Bagot reports two cases in which he says that two mulattoes after a severe malarial illness, had diminution of vision, and in a few months double soft cataract developed, which were operated upon, and visual acuity resulted, there being no disease of the fundus. Malaria will, we know, produce lesions of the vitreous and choroid, hemorrhages, which after absorption, leaves atrophic areas in the choroid; also, muscular paralysis, amblyopia and blindness, sometimes with no ophthalmoscopic findings. Then again

it may be associated with congestion and edema of the papilla. Dubelir reports a case of blindness with exophthalmus and intermittent strabismus. Sulzer's cases had hyperemia of the disk, slight obscuration of the fundus, photophobia and seeing sparks; other complications which have been observed are iritis, suppurative choroiditis, chorio-retinitis, unilateral retro-bulbar neuritis with central color scotoma and hemianopsia.

Epidemic Influenza.—The epidemic of recent years seemed to affect the eyes to a considerable extent in a variety of inflammatory affections. Rampoldi made an analysis of 532 cases of eye affections which he saw in the spring of 1890; among that number were 48 who attributed their ocular trouble to this disease. These were corneal inflammations and abscesses, irido-cyclitis, conjunctival troubles, detachment of retina and muscular troubles, both internal and external. It would seem that such a disturbance as this disease caused in the eyes of those patients, that it might be more than probable that cataract would follow. In my own experience, this disease produces in those suffering from it, the various ocular diseases such as I have named; also optic atrophy, both unilateral and double.

Typhoid and Typhus Fevers.—These two diseases cause considerable ocular disturbance, and we frequently find patients who state that their eyes began to give them trouble or to fail them after some intense febrile manifestation. Arens reports two cases, brother and sister, whose eyes became cataractous after an attack of typhus fever; an extraction gave good results. Trelat reports a cataract following typhoid fever, in a young girl. Fonton reports three cases of cataracta punctata, post-typhoidal cataract, which he thought was due to the disturbed circulation. Of these three cases, two of them, one a 28-year-old man, the other a 42-year-old woman, went on to maturity, and were extracted with good results. During convalescence, paresis of accommodation, with

dilatation of pupil is frequent, not a true paralysis, but as a part of the general debility; there is a tendency to phlyctenular affections of conjunctiva and cornea, sometimes passing into keratomalacia. Von Peterhausen reports double neuro-retinitis with macular hemorrhages. Leber and Deuschmann reported a case of double blindness with secondary optic atrophy and pigmentation of the entrance of the nerve. A case of a boy who had typhoid, examined by the writer, had an affection of the nerve and retina; his sight was much affected and his accommodation paralyzed. Four members of the same family had typhoid fever and the eyes of three were affected. The literature is full of the ocular affections due to these diseases.

Diabetes.—The frequent development of cataract in this disease is well known, and is due to disease of the vessels in the ciliary processes and to the disturbance of the nutrition of the lens. Knies states that it occurs mostly in young people, and that the cataracts are of a broad, striped variety, soft in character, which are associated at first with swelling of the lens. Frey reports double cataract in a girl of 9 years of age, one year after the beginning of the disease. The theories as to the causes of development of cataract in this disease are various. Knies cites the following, which have been advanced: 1. General marasmus, although feeble diabetics are not always attacked by cataract. 2. The removal of fluid from the lens through the medium of the sugar dissolved in the tissue juices; in two-thirds of the cases sugar has been detected in the lens and still more often in the aqueous humor and vitreous. According to this theory, the presence of a certain amount of sugar for a certain period, would produce cataract in all diabetics; this is not borne out by experience. Leber says that the clear as well as the opaque lens may contain sugar in diabetes, and Becker states that the cataract of one eye may contain sugar while the other does not. 3. The conversion of sugar in the aqueous humor into

lactic acid, is stated as a cause. As the aqueous fluid is alkaline in diabetic cataract this seems to be hypothesis; and then the opacity does not commence in the anterior cortical substance. As to the pathology of this disease, Deuschmann reports four cases of diabetic cataract, in which he found proliferation of the layer of pigment cells on the posterior surface of the iris. There were vesicular cells in the lens, and all changes from normal nuclei to entire nuclear disintegration; he therefore concludes that the opacity is due to a necrotic tendency of the epithelial structures; that if the epithelium is normal no pathologic process of diffusion can take place, even should the aqueous and vitreous contain sugar, but when the lenticular cells become necrosed, there are currents of abnormal diffusion set up and opacity is the result. Knies says that the cataract develops under the same conditions as spontaneous cataract, the result of processes in the choroid and particularly in the ciliary processes, which supply nourishment to the lens, the swelling of the lens and the proliferation process in its elements would tend to show that irritating substances are present, which stimulate the living cells to proliferation and then cause their destruction. Galezowski reports 544 diabetic eye cases, in which 31 per cent. of them had cataract and only 19 per cent. had retinal changes. Mauthner believes that the abstraction of water from the tissues, with the presence of glucose, produces cataract, in diabetics.

Syphilis.—By the disturbance of the nutritive process in the eyes secondary cataract sometimes follows this disease. Bos describes several cases of true syphilitic cataract, seen in Bandall's clinic, also speaks of cases seen by Rominee and Heller. He divides them into two classes, capsular cataracts in which iritis is present and lenticular or true cataracts, which are directly due to this disease, and are not frequent. They appear in the secondary period of the disease, and are soft in character, with no inflammatory process of the ocular coats.

Rachitis.—This disease is often the cause of laminated cataract, due to an intense disorder of nutrition in the lens. If it develops at a very early period or is intra-uterine, a central cataract forms. When this adheres to the capsule of the lens at the anterior and posterior poles, it contracts into a slender opacity and forms the so-called spindle-shaped cataract. Laminated cataract appears to be cortical in character. The opacity may at a later period move away from the capsule on account of new normal cortical substance being formed. This form of cataract is symmetrical in both eyes, but sometimes is unilateral, and sometimes congenital. The larger number of cases develop in the early life of rachitics. Knies says that it is not the rachitis, but the violent and long continued convulsions that cause the cataract, and that these spasms must occur at a period when the growth of the lens is still active, *i. e.*, before six years of age, to cause the lenticular opacity. Arlt does not believe the real cause to be the general convulsions and the consequent concussion of the body, but the nutritive disturbance of the lens due to the violent spasm of the ciliary muscle associated with spasm of the muscular coat of the vessels. The opacity usually develops from a few days to several weeks after the convulsions; in rare cases it spontaneously disappears. In cases of congenital cataract, or if developed at a very early period and is very dense, psychic blindness may develop after an extraction, due to the imperfect development of the tracts between the brain and the eye. Horner says that an analogous condition is observed under similar circumstances, in another organ, which is genetically coördinate with the lens, *viz.*, the enamel of the permanent teeth, particularly the upper incisors, exhibit horizontal grooves and ridges, *i. e.*, places where the enamel is alternately present and absent, the change is only distinctly seen during the first years after the appearance of the teeth.

Diseases of the Skin.—Mooren states that he has often seen cataract develop during chronic cutaneous

eruption. Rothmund saw it develop in early childhood among the children of three families, these having a peculiar skin affection. He states the disease to be reticular, fatty degeneration of the stratum of Malpighi and of the papillæ, with secondary atrophy of the latter and rarefaction of the epidermis; this disease began from the third to the sixth month of life, the cataract between the ages of 3 and 6 years. Of fourteen children of three families living in three adjacent villages, seven suffered from skin disease, and five of these had cataract. Nieden observed the formation of cataract in a girl 22 years of age who suffered from telangiectatic dilatation of the capillaries of the entire integument of the face; he also emphasizes the relation between skin diseases and cataract.

Whooping Cough.—Wright reports a case of a boy, 18 months of age, who had this disease and afterward developed cataract. Knapp saw bilateral blindness, from retinal ischemia. Loomis says blindness in pertussis occurs almost exclusively in those who die later of pneumonia. Jacobi reports cases of sudden maximum mydriasis and immobility of the pupil, together with double optic neuritis. Alexander and Landesberg, both report hemorrhage into the optic nerve, terminating in optic atrophy. The latter person, also saw the obliteration of the two upper branches of the retinal arteries and subluxation downward of the right lens.

Nervous Diseases.—Logetschnikow reports fifteen cases between 16 and 37 years of age, who suffered from convulsions and who afterward developed cataract; all had had good vision except one, before the seizure. He thinks that the cataract is in relationship not alone with the convulsive seizures, but with the nervous lesion, which is the cause of the convulsions. Sewill reports a case of spasm of the right orbicularis, and the subsequent development of cataract; the spasm was caused by a carious tooth which upon being removed, ceased. He explains this phenomenon as due to trophic changes in connection with the tri-

germinal ganglion. Bock* reports five cases between 34 and 39 years of age, who had meningitis and who subsequently developed cataract, underwent an operation and good vision resulted. No convulsions were present in these cases.

Pellagra.—The characteristic ocular sign of this peculiar disease is night blindness, although ophthalmoscopic findings are not uncommon. Stroppa saw two cases of optic atrophy; Neusser, diplopia and amblyopia; Rampoldi, retinitis pigmentosa, optic atrophy, disappearance of the choroidal pigment, ulcers and necroses of cornea, opacities of lens and vitreous.

Nephritis.—Deuschmann calls attention to the possibility of a connection between this disease and cataract; he reports twenty-one cases of lenticular opacity, finding albumin in 7 per cent. of these, and in six established the presence of nephritis. In 1881 he found among fifty-three cataract patients 9.5 per cent. of these had Bright's disease. Still later he examined 230 patients with uncomplicated cataract, 5 per cent. of whom were nephritic, and 11.1 affected with Bright's disease. Landesberg examined 376 patients with uncomplicated opacity of lens; he found sugar in the urine of 3, sugar and albumin in 2, and albumin in 44, and 327 with normal analyses. Rothzeigle found albumin in about half of his cases, and describes fifteen cases of chronic nephritis with cataract. Evezky, in investigating Deuschmann's theory, adopted three methods; he examined 200 cataract cases for albumin, 35 being under and 165 over 50 years of age. In thirty-eight he found albumin, 19 per cent.; in sixteen the albumin was constant; in 9 per cent. there were albumin and tube casts, these were under 50 years of age. He examined ninety-seven cases of chronic nephritis; seventy under 50 and twenty-seven older. The eye affections were albuminuria, retinitis, cataract, posterior synechiæ, opacities in vitreous, detached retina and synchysis scintillans. Incipient cataract was found in eight cases 8.2 per

cent. Of 584 old persons examined 45.2 per cent. had incipient cataract, of these 2.09 per cent. were in the sixth decade, 45.75 in the seventh, 52.6 in the eighth and 66.6 in the ninth. In fifty-nine cases, 10.5 per cent. of albumin was found in the urine, and in 1.6 per cent. tube casts; 10.5 per cent. of the cataract cases showed albumin; of the non-cataractous, 9.8 per cent. True nephritis was found in the cataractous cases in 0.8 per cent. and 2.1 per cent. in the non-cataractous cases. He concludes that albumin does not mean nephritis, that nephritis and cataract may combine, that there is no cataract in young nephritics, and in old ones, no more than is usually found in those without the sign of Bright's disease. The exact relationship between the development of cataract and nephritic disease, may not be positively shown. Yet there is evidence sufficient to lead one to believe that there is some such relation and in all cases of incipient cataract the urine should be carefully examined. Webster Fox very wisely says, "Whether albuminuria causes cataract may be a matter of doubt, but one is struck with the frequent coincidence of albuminuria in cataract patients. Michel says that cataract and albuminuria are the results of alterations produced simultaneously in the eyes and in the kidneys, from the same general cause, arterio-sclerosis.

Diseases of Heart and Blood Vessels.—Michel says that opacity of the lens is a symptom of a local or general disturbance and that cataract is caused by sclerotic changes in the walls of the carotid, in fifty-three cases he examined, fourteen of them had monocular cataract with atheroma of the carotid on same side; in fourteen there was double cataract, more developed in one eye corresponding to the side of the greater atheroma; in nine cases there were double cataract, which developed simultaneously with a double carotid atheroma; in eight cases of cataract there was sclerotic change in the carotid and on this same side there was thyroid enlargement. Karwat gives cases which confirm Michel's report, stating that there is a relation-

ship between atheroma of the carotid and the formation of cataract.

In conclusion I would enter a plea to the general physician to aid us as much as possible in our research in this direction, that the etiology of many of our cataract cases which are now obscure, may be cleared up and better understood. I would suggest that the eyes be tested for their visual acuteness, at regular intervals; the interior of the eye should also be examined to determine if cataract be present, and as to how far the sight is affected by it, and if other causes are present, how far the impairment of vision is due to them; the careful supervision of the patient for any symptoms which point to impairment of circulation and digestion. The interest of the patient demands this supervision, for by it we will become more familiar with the nature, prevention and removal of the general conditions which may be the cause of the formation of cataract. As before stated, in all cases of incipient cataract, careful analysis of the urine should be made at different intervals. Though we may not have proven a direct connection between general disease and the formation of cataract, yet it can not be denied the existence of a predisposing cause in all diseases where there is impairment of nutrition and lessened vitality.

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