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COMMUNICATIONS

A CONTRIBUTION TO THE STUDY OF EXFOLIATION OF THE LENS CAPSULE OR GLAUCOMA CAPSULO- CUTICULARE WITH ANATOMICAL PREPARATIONS

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THIS new subject, a fruit of the handling of the slit-lamp in bio-microscopy of the eye, was introduced into ophthalmology by Professor Vogt, of Zürich, (*Klin. Monatsbl. f. Augenheilk.*, 1925) one of the pioneers of that branch created by Gullstrand, of Upsala, by his invention of the slit-lamp in 1911 (Heidelberg Congress).

I beg to call attention to the fact that similar conditions of the pupillary border were noted in the pre-biomicrosopic era, but were differently interpreted, as they were always ascribed to a bleaching of the pars-iridis retinae in old people as a senile change, in chronic glaucoma as due to the increased intra-ocular pressure or, in diabetes, to depigmentation of the pigmented epithelium of the iris.

Vogt himself did not give it the right description in his first atlas; it was early in 1925, when he published his first 12 cases in the *Klin. Monatsbl. f. Augenheilk.*, that we ophthalmologists had the most complete and most precise clinical description of this condition. Vogt knew that apart from the bleaching just mentioned,

this manifestation is independent of the pigmented epithelium of the back of the iris, and that it consists of new masses which only stick to the surface of that layer. He observed them also but rarely on the surface of the lens capsule, on the iris, and on the back of the cornea, and that they change from time to time in number and position. Simultaneously with the blue fluffy masses on the iris there is a special condition of the anterior surface of the lens which was never described before. This consists of a peculiar appearance, for a detailed description of which, I refer the reader to the original articles of Vogt, and the coloured plates appended to them. In short, the capsule shows, in most of the cases, superficial changes, central, peripheral, or both combined. The central change appears corresponding to the pupil as a disc distinguishing itself from the rest of the capsule by its homogeneous haziness, or its very faint opacity. This disc is very difficult to see, except in very strong illumination (arc lamp or over voltage of the nitra lamp). The peripheral changes show themselves in the shape of a festooned ring or crown of a finely granular opacity quite separate from the disc already mentioned, or attached to it by radial zones in the shape of a wheel.

The distal boundary of the crown stops 1 or 2 mm. within the zone of attachment of the anterior fibres of the zonula. At this part the capsule or the distal edge of the crown curls on itself, thus forming an acute angle looking towards the anterior pole of the lens or disc before mentioned. This peripheral zone of exfoliation might be a complete ring, or in early cases, just a sector of the anterior surface of the lens. Vogt asserts that there are no blue masses on the pupillary border without the presence in the same eye of desquamation of the lens capsule, or in other words, the capsular affection precedes that of the iris, *i.e.*, the blue masses are the result of the capsular exfoliation.

Nine out of the 12 cases of Vogt were glaucomatous. Pillat and others reported afterwards many cases without any rise of tension, and it has since become an established fact that this kind of glaucoma is, aetiologically speaking, secondary, although I considered it primary in describing my first case (seen in August, 1926, and published in the *Bulletin of the Ophthalmological Society of Egypt* for 1927) to distinguish it from the secondary glaucoma due to irido-cyclitis.

Vogt was confronted with two problems for solution; first, the nature of these blue masses; second, the presence of glaucoma in many of these cases. It goes without saying that the right explanation of the second problem depends on the solution of the first one. Whatever it is, for the time being it is accepted that these masses might block the filtration angle. As to their nature, Vogt tried to explain it in the absence of pathological specimens, only on a clinical basis, and it seems to me he succeeded. That they

are manufactured in the posterior chamber and propagated from there to the anterior chamber is undoubted. The hypothesis that they are inflammatory exudates or deposits of some nature is refuted by the simple fact that the tissues of the anterior chamber (back of the cornea and anterior surface of the iris) do not share in the same process. The characteristic picture of the lens capsule leads Vogt to think that the lens capsule undergoes some kind of degeneration as a result of which the iris leaves on it the imprints of its posterior surface. The debris of the zonular lamella (as it is this lamella that suffers first) thus produced from the friction between iris and lens represents the blue masses in question. We shall see in the ensuing paper if this theory can explain all the clinical facts.

Handmann published cases soon after Vogt and expressed his wish that this condition should be investigated histo-pathologically. He also advanced a theory that the pigmented epithelium of the posterior surface of the iris, as a result of degeneration, adheres to the anterior lens capsule; at this new place it *proliferates and produces a glass membrane*. He goes still further in his theory, stating that the fluffy masses at the edge of the pupil have a relation to hyaline degeneration.

Wollenberg (1926) published a case of fluffy masses and exfoliation of the lens capsule in one eye where the pupil was active. In the fellow eye, where the pupil was fixed, this pathological change did not occur. This observation is quite in favour of Vogt's theory.

Busacca, of Florence (1927) reported on 30 cases out of 186 persons, backed in this report by the microscopical examination of three globes, one of which was observed *in vivo* showing the process in question with the slit-lamp. The two others were chosen out of a collection of 28 cases of absolute glaucoma kept in the laboratory. His histological material also contains two pieces of iris from two cases examined before operation. Since this is the first histological work on this subject that was undertaken, it is justifiable to include it in this paper in short. (In microscopical sections the pellicles form small isolated groups of arborizing fungoid forms which are made up of a granular substance. These hang together in some parts. Generally speaking, we are dealing with a membrane of varying thickness. The differentiation of the exfoliation or pellicle formation from inflammation, or in other words, from an organized exudate, can be made out from the histological examination. The organized exudate has a glistening white colour, while the pellicles on the contrary, look bluish-white. The exfoliation on the anterior lens capsule has nothing to do with the zonular lamella. The deposits are always placed on the outermost lamellae of the capsule, as undoubtedly shown from the histological preparations. The idea of Handmann that the fluffy masses are related to hyaline degeneration

of the pupillary border is refuted by the fact that these blue masses can be met with in quite a healthy pupillary margin. The felt-like appearance which, however, is not observed in all cases, depends on the presence of a glass membrane on the iris. Nevertheless there is no relationship between the origin of this membrane and that of the position of these pellicles).

Busacca concludes that this clinical picture occurs only in advanced age and that it is frequently accompanied by rise of tension. He also states that the deposits bring on glaucoma and not the opposite.

Personal Observation.—Early in 1926, soon after my return from Zürich, I came across an old woman showing capsular exfoliation and pupillary masses in one eye (left one, the right eye remaining intact up to now) which was affected by syphilitic irido-cyclitis simultaneously with the skin eruptions (see case No. 2). In January, 1929, I was lucky to meet with another case (No. 15), an old man showing the pupillary masses on both sides, more advanced in the right than in the left. The latter has shown advanced opacity of the lens. A total extraction, Barraquer's, was decided upon for the left eye and was carried out successfully with complete iridectomy under chloroform. At the same sitting the right eye was excised, being practically blind through rise of tension. Three specimens for laboratory investigation were obtained from this case (*a*) a piece of the iris of the L.E., (*b*) the lens of the same eye, (*c*) the right globe.

The first two specimens unfortunately did not show anything that could be taken as conclusive (probably through their mutilation during operation or during their preparation for sections). The disease was advanced in the right eye to an extent which I have never observed in any of my cases nor seen described by other writers.

The grey zone of the pupil was the broadest that I have ever come across and occupied 1-2 mm. in breadth. A coloured drawing was made for me by Dr. Haig, the ex-pathologist of the Memorial Ophthalmic Laboratory, Giza, showing the clinical appearance of the iris. In microscopical sections the changes occurring in the iris are shown while those of the lens are wanting, as this was small and subluxated and did not show the fine capsular changes.

The furrows and the grooves on the back of the iris are filled up with small highly refractile masses similar to the lens capsule. The edge of the pupil, insufficiently described by other investigators, presents a band of a dense or compressed structure showing fine lamellations, a condition which was not recognised before in ophthalmology.

In the January number of the *Klin. Monatsbl. f. Augenheilk.*, 1929, Rehsteiner, the chief of Vogt's clinic, published 17 cases carefully examined. At the same time he reported on a histological examination of one of the globes excised for recurrent pains. A good abstract of the literature of the subject accompanied the clinical material. A histological description of the iris and lens is quoted here.

Iris.—The pigmented epithelium is irregular and keeps itself to some extent (about 0.2 mm.) from the pupillary border. The stroma is hyperaemic and strongly cellular; granulation vascular tissue *lies on the most anterior layer in big areas*. The innermost pigment epithelium layer is covered with an exudate in the way of a glass membrane with few cells. The granulation tissue is seen in few parts only.

Lens.—The lens capsule is relatively thick. Fine striations of the capsule are noticeable in many sections. Exfoliation of the most superficial lamellae can be observed at a distance of 1.1 to 1.6 mm. away from the equator of the lens in numerous sections, which is much similar to its neighbouring zonular fibres with the difference that the free end of the exfoliation looks towards the anterior pole instead of looking towards the equator, as is the case with the zonular fibres. The anterior surface of the capsule at the axial part of the anterior surface of the lens could not be studied because it was covered with a thin layer of exudate, rich in cells and partly pigmented.

Unfortunately this case was not free from an inflammatory process and, so I think, cannot be taken as a criterion of this condition. Rehsteiner expressed the hope to examine further cases free from inflammatory reactions.

A year later, Vogt published in the same review a new case that fulfils the desiderata and in which the exfoliation is more pronounced than the former one as seen from the four plates produced in that work. In the same paper, Vogt concluded that the percentage of glaucoma capsulo-cuticulare to chronic glaucoma is 8.6 per cent.

In the Zürich clinic, the number of cases of exfoliation published up to date is 45, of which 34 show glaucoma symptoms, or about 75 per cent. He adds also that the operative prognosis in that form of glaucoma is not so good in comparison to the ordinary form of glaucoma, a view that we in Egypt also share.

According to Rehsteiner, this condition is only seen in 17 per thousand, in people above 60 years of age. (This last proportion is not a hospital one; it was made in the asylums for the old, in Zürich and the suburbs). As a rule this is the lowest limit of age for this exfoliation, although younger patients have been reported, Alling, 56; Busacca, 52; Rehsteiner, 55; Trantas, 45.

Vogt and Rehsteiner have never seen felt-like masses on the pupillary edge without the simultaneous presence of exfoliation of the capsule, although the reverse can take place. Rehsteiner, in his 17 cases reported 6 who presented capsular exfoliation without pupillary masses.

Trantas (Athens) gives different statistics amongst 1,540 new patients in his private clinic; 125 men and 112 women have shown the syndrome of Vogt, or more exactly speaking, 214 eyes investigated for men and 221 for women. In fact the real percentage is higher than this, says Trantas, because most of these cases were examined without pupillary dilatation. Furthermore, he adds that if all the fine capsular changes seen in old people are noted, and considered as degenerative lesions, it will not be an exaggeration to say that a quarter of all people above 55 years of age will show capsular or irido-capsular lesions.

Among his patients, Trantas observed chronic glaucoma only in 14, or 33 per cent.

This is much lower than the percentage given by Vogt and Rehsteiner, which is 75 per cent. On the contrary, advanced senile opacities of the lens were frequent and amounted to 71 per cent. He mentioned, moreover, three cases having shown senile central scotoma without glaucoma, and in three others sub-epithelial greyish patches. Fine vitreous opacities were frequently observed. He concluded that a syndrome of exfoliation is not caused by glaucoma. Its being a senile lesion is confirmed by the frequency of lenticular opacities. These eyes have a tendency to glaucoma, but this is far from being a constant thing.

As a rule, glaucoma develops after the formation of the capsular opacity. It is to be noted that (contrary to what usually happens) in two of Trantas' cases of unilateral glaucoma, the lesions in question existed only in the healthy eye, the glaucomatous one being free from the condition. Trantas says that the capsular lesions are the result of a senile degenerative process which attacks not only the anterior capsule, but nearly all the other ocular tissues, especially the glass membranes and the transparent media, the vitreous body included; a similar alteration in the excretory channels for the intra-ocular fluids explains the tendency to glaucoma. The pellicles getting free in the aqueous will be deposited in the angle of the anterior chamber and add to the obstruction of the degenerated pectinate ligament and Schlemm's canal, a degeneration which is not localized to the anterior capsule. The pigmented epithelium of the posterior surface of the iris shares in the formation of the deposited "molecules."

The picture that the capsule takes is as if it had been sprinkled over with a white powder (*saupoudrement*) and has an analogy not only to what we observe in the subepithelial layer of the cornea in

old people (*kératite micro-punctuée sénile*) but also to the punctate senile vitreous opacities described by Koby in his book and in that of Meesmann. Owing to Vogt's syndrome, we have now a better comprehension of the form of glaucoma which occurs after cataract operations without apparent cause, says Trantas. Many cataractous patients are affected with this syndrome; it is not astonishing to see in some of the operation cases for cataract that the degenerative process advances towards glaucoma independently of the operation. I must say, adds Trantas, that once the cataract is mature, capsular opacities, crown and disc are difficult to make out; in such instances the change in the pupillary border helps in the diagnosis.

Let me say once more, according to my own observations, continues Trantas, that the size of the disc is not of the same extent as that of the pupil in old age, or in other words, the edge of the disc is not produced by the pupillary action on the lens. I do not think that at the beginning of the degenerative process there is a formation of a thin membrane spread on the whole surface of the capsule and that the ultimate picture or design is produced by the iris movements. One often sees early in this process, some isolated opacities in the central part of the capsule associated with an opacity of a small segment at the periphery which from the very beginning, sends in tongue-shaped prolongations. Trantas agrees with Vogt in that a second exfoliation can take place within the first one, a phenomenon indicating a recent exfoliation on the top of that area which has already shown an old exfoliation, or in other words, that all the capsular superficial lamellae take part in the degenerative process in turn, one after the other.

Other Clinical Phenomena

The brown pigment on the back of the cornea found in 13·6 per cent. of my cases, and reported also by Rehsteiner, especially after pupillary dilatation seems to be an interesting occurrence and is worth consideration. Whether it is a mere coincidence in these cases or a part in the syndrome of this disease is difficult to tell. Dissemination of the uveal pigment was reported by Koeppe as an early bio-microscopic sign in glaucoma. It is of a usual occurrence after intra-ocular operations and uveal inflammations. Besides operations and uveal inflammatory conditions, this pigment was not reported in other ocular manifestations. In many of the cases reported in my lists, the pigment was observed before the onset of glaucoma. It seems that the iris tissues, especially those cells of the pars-iridis retinae, share in the degenerative process, and the pigment is set free in the aqueous. This explains the observations of Rehsteiner, as the artificial dilatation helps in crushing or in teasing the diseased pigmented epithelial cells on the back of the

iris, resulting in a fall of the pigment granules from behind the iris like drops of rain. Atrophy and depigmentation of other structures of the iris are frequently seen by diaphanoscopy in these cases. The pigment granules thus set free from the different pigment cells of the iris wander to reach the aqueous and from this fluid to the back of the cornea as usual. Some of the eyes bearing this affection of capsular degeneration show a low degree of vision which cannot be accounted for by the clinical findings or in other words, there is no ratio between the amount of sight left and the degree of pathological change. A good example of this is the case of Nosseir Bey, (case No. 4), the left eye of whom is practically blind, counting fingers at 50 cm. without apparent cause. This eye, although showing sclerosis of the nucleus, has a fairly good peripheral red reflex and a fundus free from any gross changes. It is interesting to note that many of the eyes afflicted with this degenerative process show an increase of intra-ocular pressure, a relative one in comparison with the healthy fellow eye, before passing to the abnormal limit (examples, cases No. 4, 10 and 11). This by itself might explain the deterioration of vision in some cases.

Personally, I have seen in another category of cases the development of excavations of the disc accompanied by fields characteristic of glaucoma in eyes which have never shown, after long observation and careful tonometry, any rise beyond the normal limit, but, of course, with a definite difference between the two globes. This might be called relative glaucoma, and might explain the unaccountable deterioration of vision.

Histopathology of my own Material.—First specimen, case No. 15. As soon as the eyeball was excised it was put in 4 per cent. formalin and sodium chloride solution and cut vertically; stained with eosin and haematoxylin in the ordinary way.

Cornea and Angle of Anterior Chamber.—There is no particular change either in Descemet's membrane or in the endothelial layer lining it. Pellicles or felt-masses are very scarce on this layer. In the anterior chamber some coagulum is present, either pathological or an artefact, made of a finely granular substance which stains faintly with eosin and is not highly refractile. Some of this substance lies on the anterior surface of the iris (as can be seen in Fig. 1), where is found the part of its base sharing in the formation of the angle of the anterior chamber. This angle is of normal width similar to what occurs in many of the forms of secondary glaucoma, unlike what happens in primary absolute glaucoma. The angle, notwithstanding its width, looks crowded, and the spaces of Fontana look blocked by a black pigment. A homogeneous mass (big pellicle) runs from the pectinate ligament to an opposite point at the base of the iris. This pellicle if not an artefact would be probably one of those masses described by Trantas passing from the

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Ophthalmological Society of Egypt."*

back of the cornea to the iris, and originating from the exfoliated capsular lamellae; against this possibility is the fact that it is not highly refractile. The absence of this property might be due to its lying flat in the section or being looked at by the microscope from its flat side. On the opposite side of the angle, a few fine minute refractile masses lie on the pectinate ligament.

Iris and Edge of Pupil.—In general configuration the pupillary border in this case looks rounded instead of tapering in a wedge-shape as is seen with the normal iris. The pars-iridis retinae stops

FIG. 1. CASE NO. 15.

a short distance from the free edge of the pupil and is not seen from the front. Its normal place on that edge is taken by small pigmented nuclei from within, and a finely lamellated mass from without. This mass starts where the pars-iridis stops, and represents the broad bluish-grey band or circular ring observed clinically *in vivo*. It differs in size in different parts and sections. It stains faintly with eosin and is not highly refractile. Although its origin is obscure, I do think at the present moment that it is formed by the superposition of the minute exfoliated masses (Fig. 2). During life, in cases where this ring is formed, the recent felt-masses are seen to be independent of it as they are seen to peep from behind it, or stick loosely to it. Evidently it is not hyaline as supposed by Handmann.

On the back of the iris there is a layer, newly formed, more or

FIG. 4. CASE No. 15.
Showing masses in the furrows.

FIG. 5. CASE No. 15.
Masses arborizing as described by Busacca.

less continuous, rarely interrupted, thick in the furrows and thin in the ridges. This layer is mostly composed of the minute felt-masses in question with a granular substance cementing these masses together (Figs. 4 and 5).

This granular substance, which looks like fibrin, might be powdered lens capsule seen clinically as granular patches before being shed.

FIG. 6.

Late Professor E. Fuchs. Zonular lamella *in situ*, in continuation with the zonula but refracts the light somewhat differently from the rest of the capsule.

This felt is not deposited only on the back of the iris but goes further, to the part of the ciliary processes and ciliary body forming the posterior chamber, as well as on the fibres of the zonula taking part in the formation of that chamber. The felt-masses have the same affinity for colours as the capsule and the same refractile

power. Their shape is rod-like, either straight or distorted (see Fig. 4). In Fig. 5 can be seen the masses, mainly granular, arborizing as described by Busacca. In some parts the masses look like mycelium.

Lens.—The lens is subluxated; the capsule ruptured during preparation and for that reason I will refrain from speaking about it except that it is much thinner than normal, contrary to what was described by Rehsteiner and Vogt; both have reported thickness of the capsule in their cases. This diminution in thickness in my specimen may be accounted for by the capsule having been used up to produce all that amount of felt seen in this particularly advanced case.

In conjunction with the illustrations already mentioned, I might make use of other sections forwarded to me by the late Prof. Fuchs on February 17, 1928, in answer to my letter on this subject for the purpose of elucidation on some points. The first (inflammatory glaucoma, Fig. 6) shows the zonular lamella in continuation with the zonula (ligamentum lentis) and distinguishable from the capsule as an extremely thin layer refracting the light somewhat differently from the capsule itself.

In my first paper on exfoliation (O.S. of Egypt, 1927 Bulletin), I have said that this process is an exfoliation of this lamella. After the recent publications of Vogt and Trantas, the exfoliation does not seem to be limited to that lamella only, all the superficial lamellae share in this manifestation one after the other. The second section deals with a case of absolute glaucoma, where a piece of the zonular lamella is detached and folded within the posterior chamber (Fig. 7). On the pupillary border of the opposite side, a homogeneous mass (coagulum), is seen (Fig. 3).

The master of pathology of the eye questions in his letter whether it corresponds with the fluffy masses of Vogt. To my mind this coagulum might be similar to the hyaline degeneration of Handmann but it has nothing to do with the syndrome described by Vogt, the two pictures (Figs. 2 and 3) are absolutely different from each other.

Histopathology of the Second Specimen. Right eyeball of case No. 24. The vision of this eye was lost through glaucoma. The left eye did not show any sign of rise of tension during her stay in hospital, notwithstanding medicinal pupillary dilatation. Right eye fixed in Bouin's solution, embedded wholly in celloidin and cut vertically.

The cornea shows nothing characteristic except impregnation of the cubical endothelium lining the lower half of the posterior surface with pigment granules (see Fig. 8). It is interesting to note that this pigment could not be seen clinically, which means that the percentage of 13.6 is in fact a low one, and if all the

FIG. 7.

Showing detachment of zonular lamella in the posterior chamber.
Professor E. Fuchs's material.

FIG. 2. CASE NO. 15.

FIG. 3.

Late Professor E. Fuchs. See homogeneous mass (? coagulum) on the pupillary border.

FIG. 8. CASE NO. 24.

Cubical endothelium of corneal posterior surface impregnated with pigment granules.

eyes had the same fate this number could have been much higher denoting that the depigmentation process goes hand in hand with the exfoliation.

The angle of the anterior chamber is wide as described in the first specimen. The meshes in the pectinate ligament are heavily studded with pigment granules as suggested by Trantas.

Iris.—This membrane is the site of most of the pathological changes and is worth a minute study. The anterior surface looks

FIG 9. CASE NO. 24.

Posterior surface of iris showing pellicles from lens capsule stuck to it and following its furrows and ridges.

normal; here and there are masses of fine granules, either fibrin or powder from the lens capsule. The free border is not rounded as in case No. 15; it is rather tapering as is met with in normal cases.

The pigment layer of the posterior surface stops a short distance away from the pupillary border leaving that border unpigmented. The tissues of the very tip of the iris are rarefied and devoid of pigment cells. The proximal end of the sphincter is poorly covered with connective tissue and lies nearly bare in the aqueous humour. The posterior surface of the iris is covered with a membrane similar in appearance to that of the first case. There are in it short rods, highly refractile, or complete flakes from the lens capsule (Fig. 9). Besides there are, here and there, masses of

FIG. 10. CASE NO. 24.

Absolute glaucoma. Optic nerve in section, showing shallow excavation.

FIG. 11. CASE NO. 24.

Note the rarefaction and depigmentation of pupillary border, the sphincter standing out by contrast.

mycelium-like arrangement of the same nature as the rods. This is a further proof of the capsular nature of these masses.

It is interesting to note that in sections the optic papilla did not show any cupping, except some yielding of the lamina cribrosa looking in that respect more like a physiological excavation than a glaucomatous one (Fig. 10), or in other words, there seem to be other unknown factors which help in producing blindness, besides the rise of tension.

SUMMARY

				Per cent.
Eyes showing pupillary masses	...	41	out of	44 = 90
Eyes with rise of tension	...	29	„	44 = 45
Persons showing glaucoma	...	13	„	24 = 54
Cataractous eyes	...	17	„	44 = 39
Pigment on posterior surface of cornea	6 eyes	„		44 = 13.6
Youngest age	...	55 years		

N.B.—Total, 24 patients=48 globes, 44 of them used in the statistics, four being destroyed by other diseases. Five patients only reported from Giza Ophthalmic Hospital and its Memorial Laboratory, although the number of cases noted by me and by my colleagues is much higher, as only five tickets could be traced.

This ailment is insidious, of a long duration, and takes years for its development. It is rare, but the more it is looked for, the more it is met with. According to the Zürich Eye Clinic, 17 per thousand of old people above 60 years of age (not hospital patients) show Vogt's syndrome. Half of this number at least, if not all, tend to develop sooner or later chronic glaucoma, and it figures as 8.6 per cent. of chronic glaucoma. This disease is not an inflammatory one, it is a senile degeneration of the lens capsule of some sort. Depigmentation of the iris tissues plays an important part in this process. As a rule the tension rises gradually, and it is higher in those eyes which show degenerative process most. The intra-ocular pressure, before passing to the abnormal, may stay for a long period within the normal limits, but decidedly higher than those eyes which do not show the affection at all, or only to a slight extent. This condition by itself is apt to have a deleterious effect on the field of vision and the optic nerve.

The edge of the pupil undergoes certain definite changes; soon

after the exfoliation of the lens capsule in early cases, isolated felt-masses, bluish-white in colour, begin to appear, principally at the pupillary border, on, or within, the corrugated ring of the retinal pigmented cells of the iris (pigment cells of the back surface). Later on, this corrugated black or darkly pigmented ring at the edge of the pupil disappears slowly, either partially or totally. A grey band or ring replaces the normal black one. This abnormal appearance of the pupillary border can be produced either by the superposition of the felt-masses at the pupillary border or by ectropion of that border showing the newly formed membrane aforementioned, and produced by the felt-masses on the back of the iris.

These facts are observed in the first eyeball (of Case No. 15, Abdullah) submitted for histological examination. From the second globe (Case No. 24) submitted to the same process, we learned that a similar grey ring can be produced by the depigmentation of the very tip of the iris tissues bringing to view the proximal edge of sphincter muscle.

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PRIVATE

NO. OF CASE	AGE	CORNEAL POST. SURFACE			PUPIL		LENS CAPSULE		TENSION	FUNDUS REMARKS	VISION
		Masses	Pigment		Masses	Atrophy	Disc	Crown			
(1) First case before Vogt's publication	70	R. - L. +	- +		+ +	+ +	Aphakia ?	No capsule left in P.A. +	Occasionally + "	O.D. pale Not seen, cataract	3/60 with correction H.M.
(2) 15/8/26 1927 Bulletin O.S. of Egypt	70	R. Normal L. +	-		+ No mention	- -	-	++	T.N. 65 M.L.		6/24 6/60
(3) 17/12/27	75	R. No mention L. "	No mention "		+ ++	- +	-	No mention +	T.N. T.N.		3/60 3/60
(4) 31/1/28	70	R. - L. -	- ++		+ ++	+ +	Pigment -	Hardly any early exfoliation	28 M.L. 35 M.L.	L.O.D. not pale, no cupping, nuclear sclerosis	6/60 c.f. 50 cm.
(5) 8/4/28	70	R. - L. -	- -		+ -	- Unsuccessful lens extraction	- -	Exfoliation	T.N.		6/60 No P.L.
(6) 9/6/28	70	R. -	-		+	-	-	Exfoliation	35 occasional rise 40-45 M.L.		6/60
(7) 7/7/28	77	R. - L. -	+ +		+ +	- +	No mention "	Advanced exfoliation Not advanced	T. + 3 T. + 3		H.M. No P.L. c.f. 1 m.

EXFOLIATION OF THE LENS CAPSULE

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P R I V A T E—continued

NO. OF CASE	AGE	CORNEAL POST. SURFACE		PUPIL		LENS CAPSULE		TENSION	FUNDUS REMARKS	VISION
		Masses	Pigment	Masses	Atrophy	Disc	Crown			
(8)	29/9/28	R. - L. C. nebula	-	+	No mention Amblyopic	No mention	+	T.N. cataract free	Extract. by me from exfoliation	With cor. 2/60 c.f. 1 m.
(9)	5/11/28	R. -	-	+	-	-	Filaments and pigment on anterior capsule Sec. glaucoma after iridocyclitis	T.N.		No mention
(10)	23/5/30	R. -	-	+	+	?	+	T.N. 20	Total extract. after trephining by me successful	No P.L. 6/36 with cor.
(11)	4/12/30	R. +	-	+	Partial rigidity for dilatation	?	+	38 M.L.	Cataract	H.M.
(12)	4/12/30	R. - L. -	-	+	same +	-	+	35 M.L. 24-28 with glaucoman	Extra capsular iris submitted in sections	H.M. with correction ?
(13)	24/12/30	R. - L. -	-	+	Not men- tioned	Not men- tioned	+	24 M.L. T.N. T.N.	Good R.R., no gross changes	1/60 — —
(14)	17/1/31	R. - L. -	-	+	Not men- tioned	Sublux- ated lens +	Not seen +	Normal with miotics + 15-20 M.L.	Absolute glaucoma Slight myopia	No P.L. 3/60 with cor. 6/36 1/60 1/60

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EXFOLIATION OF THE LENS CAPSULE

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No OF CASE	AGE	CORNEAL POST. SURFACE		PUPIL		LENS CAPSULE		TENSION	FUNDUS REMARKS	VISION
		Masses	Pigment	Masses	Atrophy	Disc	Crown			
(15) 17/1/28 R. globe excised for sections	76	R. Not mentioned		+	+	Lens subluxated	Subluxated	45 M.L.	R. and L. cataract	H.M.
		L. "	"	+	Not mentioned	Not mentioned	Exfoliation	"	L.O.D. pale, no cupping	- 3/60 with cor.
(16) 18/3/28	65	R. Absolute L. No mention	+	+	detach. of No mention	retina Not mentioned	No mention	27 Sch.		No P.L. 1/60
(17) 17/5/28	70	R. +	-	+	+	Not mentioned	No mention of exfoliation	22 Sch.	Cataract	H.M.
		L. -	+	+	+	"	Wide exfoliation	"	Cataract, immature	20 cm.
(18) 17/6/28	60	R. -	-	+	No mention	Nothing seen from lens except central part due to rigidity of pupils, all means tried for dilatation but failed	Exfoliation	18 Sch.	Brown nucleus	H.M.
(19)	70	L. -	-	+	"	No mention	No mention	18 Sch.	"	H.M. bad proj.
		R. -	-	+	No mention	No mention of exfoliation	No mention of exfoliation	T.N.	Senile cataract	Not taken
		L. -	-	+	"	exfoliation Pupils rigid like previous case		T.N.	"	"

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No. of Case	AGE	CORNEAL POST. SURFACE		PUPIL		LENS CAPSULE		TENSION	FUNDUS REMARKS	VISION
		Masses	Pigment	Masses	Atrophy	Disc	Crown			
(20) 23/3/30	50	R Not mentioned		+	+	Not mentioned	Not mentioned	24 Sch.		H.M.
		L. "	"	+	+	"	"	50 Sch.		No P.L.
(21) 24/5/30	65	R. -	-	-	-	-	"	18 Sch.		3/60
		L. Not mentioned		+	No mention		Capsule even	18 Sch.	Phacoerisis	6/36
(22) 20/12/30	55	R. -	-	+	-	Not mentioned	Exfoliation	18 Sch.	Coloboma up with good result	cf. 50 cm.
		L. -	-	+	-	"	Exfoliation more	35 Sch.	Retrephined by me for recurrence of tension, nuclear opacity	4/60
(23) 1/1/31	65	R. -	-	+	-		Aphakia	15 Sch.		1/60 with cor. 4/60?
		L. -	-	+	-	-	Exfoliation	31 Sch. 21 under drugs	Total extract., good result, lens prepared	
(24) R. excised for sections	60	R. -	-	+	+	Subluxated		50 Sch. after glaucoman = 28 Sch. 22-26 Sch.		No P.L.
		L. -	-	+	+	-	+			4/60