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WOOD & PUSEY

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(With five appended plates.)

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INTRODUCTION.

AT the outset we desire to acknowledge our great indebtedness to the gentlemen who so kindly answered the circular letter on the subject of iris sarcoma that we sent out some months ago. The reader will soon discover that without their kindly and generous assistance this paper could not have been written.

It is of historical interest that the first cases of primary sarcoma of the iris recorded, in which microscopical examinations were made, are those of Hirschberg[28] and Lebrun,[41]

[1] From the Eye Clinic of the Chicago Post-Graduate Medical School and the Pathological Laboratory of Rush Medical College.

published in 1868. Preceding these records, Tay,[58] in 1866, reported his case as a primary *cancer* of the iris. The term cancer is often — more frequently in the past than at the present time — used to mean some form of malignant tumor; if Tay used the term in this sense, he should have the credit of recording the first case with histological examination. Antedating all of these cases, Stöber,[65] in 1853, described his case, observed during the years 1830–35. There was no histological report, but the patient died of what was supposed to be a brain tumor. In 1876 Kipp[33] reported a case and furnished the first review of the literature of the subject. Three years later Knapp[36] published an account of three cases, and added to the bibliography several cases which Kipp had overlooked. In 1882, Fuchs's[19] work, *Das Sarkom des Uvealtractus*, appeared, and in this monograph are collected the cases recorded up to that time — sixteen. In 1885, Pflüger[61] described an iris sarcoma, and collected other cases, among them the later history of Schiess's[62] Case 4, which he obtained in a personal letter from Profs. Schiess and Horner, and which, by the way, some of the later authors have not referred to.

Since 1885, Oemisch,[48] Ewetzky,[14, 15] Werther,[74] Veasey, and others have reported cases, made studies of this condition, and reviewed the literature of the subject,—the last three writers having completed the bibliography to the year 1898.

That our work may be of greater accuracy and, in our opinion, of more value, we have included in it only those cases in which a histological examination of the tissues was made and the clinical diagnosis thus confirmed. This excludes from our list some cases which are included in the lists of other authors. Among these are the cases of Eperon,[1] Horner,* Fuchs,[18] Arlt,[5] Nettleship,[47] von Hasner,[28] Owen,[49] Galezowski,[20] Berthold,[7] Stöber,[65] Roosa,[57] and others. In most of these cases the clinical diagnosis was made, but operation was refused. Dr. O. Pürtscher, of Klagenfurt, reports to us, in a private communication, a

[1] Cases reported by letter to Pflüger and cited by him in the *Bericht über das Jahr 1883*, Univ. Augenklinik in Bern.

case under his care at present, in which, while the diagnosis is plain, the patient will not allow operation; Czermak, W., sends us the clinical history of a case of iris sarcoma, but the removed tissue had not been examined histologically; Dr. J. O. Tansley, also in a private letter to the authors, describes a case of multiple sarcoma with several foci, two at least in the brain, one in the right iris and several upon the body. These cases must be excluded. Szili[45] speaks of examining histologically a globe which had been removed because of a small sarcoma of the iris, but gives no clinical history of the case.[1] Hess[37] records a case of sarcoma of the iris which he found in the eye of an ox.

That the bibliography may be as accurate as possible, and for other obvious reasons, we decided to make use of original articles or original communications only. The one exception to this rule is the report of Hubrich,[39] an abstract of whose article was taken from the *Jahresbericht über Ophthalmologie.*

The authors desire to acknowledge their great indebtedness to Professors Hektoen and LeCount for their kindly interest in this work.

Before discussing the subject of primary sarcoma of the iris in general, we introduce complete reports, with illustrations, of our own case and the cases of Drs. Coleman, Hotz, Denig, Friedenwald, and Komoto," of Tokio, Japan. These gentlemen will report, or have already reported, these cases themselves. The case of Dr. Komoto is given in full with drawings, because, although previously published, articles in the Japanese language are practically inaccessible to the readers of this monograph. Also, before discussing the subject in its general aspects, we publish (1) abstracts of new cases, which have been sent to us from private records, and (2) abstracts of cases previously recorded. It has been our great good-fortune to have collected twenty-three unrecorded histories, which we are able to add to the sixty-four cases previously published. In our collection of previously

[1] Since writing the above Szili has kindly sent to us an abstract of the clinical history of this case (see Appendix) and histological sections from the globe.

recorded cases, some will be found that were overlooked in former bibliographies, notably those of Lawford and Collins,[60] Pansier,[61] Schneider,[62] and Wedl and Bock.[63]

We have purposely made the abstracts as brief as is consistent with clearness, and our questions in the circular-letter of inquiry were as few as possible, so that the gentlemen in answering would not be put to more trouble than was necessary.

THE AUTHORS' CASE.

On June 2, 1900, Mrs. C., age forty, presented herself at the clinic of Dr. Wood, complaining of a feeling of fulness in the right orbit, which she attributed to a growth in the eye. Patient states that she has never suffered from any serious illness. The family history, on the side of her mother, whom she says she closely resembles, is somewhat peculiar. The patient's mother, two maternal aunts, and one maternal uncle died of malignant tumors; one of these, an aunt, from recurrent tumor of the eyeball.

The patient has had no previous ocular affection, except an asthenopic attack five years ago, probably due to prolonged insomnia, from which she recovered entirely. In February, 1899, she noticed a sensation of fulness in the right eye, and about that time first perceived something growing on the iris. Shortly afterwards she suffered from supra-orbital neuralgic pains, accompanied by lachrymation—all confined to the right side. These symptoms led her to a more careful examination of the eye, and she observed two other smaller spots on the iris, one situated above and one below the pupil. (See Plate I., Fig. 1.)

On examination, the tension was + 1; the vision $\frac{20}{20}$. The superficial scleral vessels were slightly enlarged. In the horizontal median line on the temporal side of the right iris there was a dark brown, smooth, irregular, triangular new-growth; it was apparently of about the same thickness as the iris, and was elevated above its plane. The base of the neoplasm was 3 *mm* wide, and was applied to the root of the iris, while its apex did not quite reach the margin of the pupil when that aperture was in a state of medium dilatation. The tumor looked as if a piece of dark brown velvet had been laid on the iris. By oblique illumination the edges and some parts of the growth appeared to be translucent.

Its borders were sharply defined, its surface seemed homogeneous, and the neighboring iris tissue was not discolored or muddy. Two deposits of apparently the same character as the one described were located on the nasal half of the iris. They were of the size of pins' heads and were within, respectively, the upper and lower quadrants. (See Fig. 1.)

The pupil dilates irregularly with a mydriatic. There are no synechiæ, but the irregular dilatation is brought about by the fact that in the region of the tumor the pupil does not respond to the mydriatic. The media and fundus are normal.

The left eye is normal and the iris is free from abnormal pigmentation.

After keeping the patient under observation for a short time, a broad iridectomy (the only operation to which consent could be obtained) was done, including the whole of the temporal mass. Healing was uneventful.

After the operation the tension became almost normal (it is still somewhat raised) and the scleral injection less. In September, 1900, R V, with correction, is $\frac{20}{20}$ —. The patient complains of photophobia in a bright light, and of blurring if she tries to do near work.

As the patient can be kept under close observation, Dr. Wood agreed to delay further operative measures, warning the patient, however, of the dangerous character of the growth and the possibility of the necessity of enucleation of the eye if any further evidences of the new growth appeared. In March, 1902, there had (apparently) been no return of the neoplasm, and the ocular symptoms were the same as noted in September, 1900.

The tissue removed by iridectomy was about 5 *mm* long by 4 *mm* wide by 2.5 *mm* thick. It was hardened, then embedded in celloidin and sections made. The sections were stained by various methods. Histologically the tissue shows practically no resemblance to normal iris, with the exception that in a few sections there can be recognized a portion of the sphincter muscle, and in places one can make out the posterior epithelial pigment cells. The tumor consists of a mass of densely packed, small round and small spindle cells, with practically no intercellular substance (see Plate I., Fig. 2). Here and there cells are arranged in rows or in groups—alveolated. Where groups are found the cell formation is usually around a blood-vessel, and the cells just adjacent to the vessel seem to encircle it. There are blood-vessels with

normal walls, which are probably the vessels of the vascular system of the iris; and there are blood-spaces, such as are usually found in sarcomas. The cells are partly pigmented, in part unpigmented. The pigment is granular and of a dark brown color. The granules vary in size, but are usually very small. They are generally within the cell body, but in places are found scattered about, outside of the cells. The pigment does not give the iron reaction with potassium ferro-cyanide and hydrochloric acid.

Two types of pigment-bearing cells are seen—the pigmented tumor cell, and the branched pigment cell normally found in the iris. The latter are not very abundant and are, probably, the remains of normal tissue. In places the pigmented epithelial layer may be made out, and at several points in this layer there appears to be a cell-multiplication, constituting an invasion, as it were, of the tumor by these epithelial cells.

All of the tissue mass is sarcomatous—pigmented, small round-, and small spindle-cell sarcoma.

DR. W. FRANKLIN COLEMAN'S CASE.

The man, aged nineteen, first consulted Dr. Coleman January 2, 1901. He said that the right eye was injured six years ago by the explosion of a gun-cap and that inflammation followed and continued for three weeks. The eye recovered perfectly and remained well until four days ago, when it began to get red.

Status præsens.—R. E.: General subconjunctival injection, pupil small and oval, V = $\frac{8}{20}$, no pain. There is an old opacity of the cornea (probably at the site of the injury) and a grayish membrane at the lower margin of the iris, extending into the posterior chamber. There is no history of syphilis. Diagnosis: Iritis, foreign body in eye. (?) Prescribed atropin, etc.

Jan. 22d.—Pain in eye. Prescribed calomel, gr. $\frac{1}{10}$ hourly and heat to the eye. *Jan. 28th.*—Pain slight. *Jan. 31st.*—V = $\frac{8}{200}$. Cupped temple. *Feb. 8th.*—Relapse of pain. Prescribed potassium iodide, grs. 20, t. i. d. *Feb. 14th.*—V = $\frac{8}{100}$. Some pain. *Feb. 18th.*—Skiagraph negative as to foreign body in eye. *March 11th.*—Discontinued potassium iodide. Prescribed proto-iodide of mercury, gr. $\frac{1}{4}$, every 2 hours.

April 27th.—V = $\frac{6}{8}$. Pain severe last night. Lower half of bulbar conjunctiva, which has never been quite free from injection, is now extremely injected. With triplex magnifier a nodule is seen 2 *mm* in diameter and 2 *mm* high (the color of fresh pan-

creas) situated on the anterior surface of the iris, just external to the centre of the lower margin. The surface of the nodule is vascular—there being eight or ten vessels running over its surface. The growth begins about 1 *mm* from the pupillary edge of the iris, and extends to within 1 *mm* of its ciliary border. (See Plate II., Fig. 3.) The temporal side of the growth is covered by iris fibres running down and in, while the nasal side lies on the iris. There are several prominent episcleral vessels just below the cornea. Diagnosis (tentatively): sarcoma of the iris.

May 14th, the patient was exhibited at the Chicago Ophthalmological Society. Dr. Pusey thought the growth a sarcoma. Dr. Wood suggested potassium iodide for three months, and Dr. Bulson, the same remedy for ten days.

May 16th.—Prescribed potassium iodide, grs. 45, t. i. d., and *May 17th*, grs. 60, t. i. d. *May 18th.*—Pain in eye all night. General bulbar injection. Prescribed sodium salicylate, grs. 20, t. i. d. Discontinued K. I. *May 20th.*—Little pain or injection. Apex of growth ruptured and cheesy nodule escaped; this reaches to cornea. Dr. Wood examined the eye and reports: "Certainly the case looks very like a malignant tumor. The micro-telescope of Howe shows the extreme vascular character of the growth very well. What curious folds of the iris are produced by dragging on the pupillary edge!"

May 20th. Operation.—The growth was as completely removed as possible by an iridectomy, but the iris and growth were so adherent to the underlying tissues that they had to be removed piecemeal. These were placed in 10 % solution of formalin and given to Dr. Brown Pusey for examination.

June 4th.—The tension, which has been low since operation, is now normal. V = Fingers at 10 feet. On the report of the histological examination, enucleation was advised and refused.

Aug. 10th.—V = $\frac{6}{15}$. No redness of conjunctiva for past month. Fundus normal.

Feb. 12, 1902.—V $\frac{6}{9}$. No pain. Eye is usually quiet, but becomes red frequently—"about two days in a month."

The tissue removed by iridectomy was about 4 *mm* x 3 *mm* x 2 *mm* in size. It was fixed in 10 % formalin, embedded in paraffine, and serial sections were made. The sections were stained with hæmatoxylin-eosin.

Histologically, seen with a low magnification, the tissue has a reticular structure; it is full of nucleated cells, and the blood-

vessels are engorged. Resemblance to normal iris is entirely lost.

In a region where the cells are more closely packed and the area increased — evidently the portion which showed clinically as tumor — a high power (oil immersion) exhibits a mass of irregularly shaped cells with round and oblong nuclei (see Plate II., Fig. 4). These cells are fairly densely packed together. Some of them contain granular pigment. Scattered among these cells are many polymorphonuclear leucocytes, these being particularly abundant in and around the numerous blood-vessels.

In a region where the cellular tissue is loosely arranged the large cells above described are abundant, while the numerous leucocytes and the engorged vessels give the appearance more of an inflammatory area than of tumor growth. All of the excised tissue shows the presence of the tumor cells. The tumor is a round-celled, pigmented sarcoma, with the surrounding tissue showing an unusual degree of inflammatory reaction.

DR. F. C. HOTZ'S FIRST CASE.

The patient, a man aged thirty-two, first consulted Dr. Hotz in June, 1894. He stated that as far back as he could remember there had been a small spot on the lower nasal part of the iris of the left eye. This spot began to increase in size about one year ago. In June, 1894, there was a small flesh-colored tumor in the lower nasal quadrant of the iris, which projected to the posterior surface of the cornea, and pressed against it. The pupil was drawn out towards the tumor. There were no signs of inflammation. Fundus was normal. Tension increased. V = $\frac{20}{30}$. A few days after the patient was first seen, Dr. Hotz removed the tumor by "excision of iris portion to which the growth was attached by a broad base."

The eye made "a quick recovery ; for a time a grayish deposit was visible on the ciliary processes within the iris coloboma." The tissue was examined microscopically by Dr. Wm. H. Wilder, who confirmed the clinical diagnosis of sarcoma, and who kindly put his sections at our disposal.

The patient has been seen frequently since the operation by Dr. Hotz ; and on June 15, 1900, Dr. Hotz has the following note : "Coloboma perfectly clear, fundus normal. V = $\frac{20}{20}$ with Sp. + 0.50 ⊃ + 0.50 Cyl. Ax. 180°."

Histologically, the tissue shows no resemblance to normal iris,

except that at the tip of the mass one can make out the altered sphincter muscle, and along the posterior surface there is a more or less altered row of pigmented cells. In confirmation of the fact that these are the pigmented cells of the *pars iridis retinæ* is the finding that they are continuous with the pigmented cells of the *pars ciliaris retinæ*. The latter cells remain as the lining of cross-sections of processes of the ciliary body, which processes are found in the sections (see Plate IV., Fig. 7). The tissue consists of a mass of densely packed small round and small spindle cells. The cells invade the whole tissue, including the ciliary processes. Some of the cells are pigmented, but the pigment is scanty.

The tumor is an alveolated, pigmented, small spindle- and small round-celled sarcoma.

DR. HOTZ'S SECOND CASE.

The patient, a healthy woman, age forty-three, stated that the tumor had been noticed for about two years. On examination of the eye it was found free from irritation. There existed in the lower temporal section of the iris a small flesh-colored nodular growth flattened against the cornea; the growth was attached to the iris by a narrow pedicle. The pupil was drawn towards the tumor. Tension normal. $V = \frac{20}{20}$.

The growth was removed by "excision of iris portion." "Healing uneventful and no recurrence after two years."

The histological examination by Dr. Harold Gifford showed non-pigmented, small round- and small spindle-celled sarcoma.

DR. R. DENIG'S CASE.

The clinical history is as follows: The patient, an Irishman, age fifty-four, consulted Dr. Denig March 26, 1900. For about four months he had noticed a decrease of the sight of his left eye. The right eye is normal. L.E. Vision $\frac{20}{40}$; the lower part of the cornea — beginning in the pupillary region down to the iris angle — is hazy; the fundus can be seen and seems to be normal. Reaction of the pupils normal, as are the visual fields, etc. No plus tension, although patient complains once and awhile of glaucomatous attacks in the affected eye.

The eye was enucleated March 30, 1900, and the recovery was uneventful. The patient was seen last in July, 1900, when he was in good health.

As is shown in the drawings lent us by Dr. Denig (Plate III.,

Fig. 5), the tumor extends forward and is intimately adherent to Descemet's membrane. It fills the angle of the anterior chamber in the region of its growth, and invades the ciliary muscle and ciliary processes; in the section at our disposal the ciliary processes are particularly involved, and the tumor is pulled away from the lens—probably in the hardening process. Adherent to the lens capsule are pigmented cells. The only remnants of the iris recognizable are the posterior pigment layer and the tip of the iris containing the sphincter muscle, which projects from the end of the tumor. In minute structure the growth is an alveolated, pigmented, small spindle-cell sarcoma (see Plate III., Fig. 6). The cells are quite small, with comparatively large granular nuclei, and they are arranged about blood-vessels. The growth closely resembles those tumors classed as *peri-endotheliomas* (Borrmann). The vascular spaces have very ill-formed walls. The pigment is evenly distributed, the cells in the region of the pigment layer of the iris and of the ciliary body containing most coloring matter. The section shows nothing more of interest excepting glaucomatous cupping of the optic nerve.

CASE OF DRS. AARON AND HARRY FRIEDENWALD.

The patient, a female, age fifty-five, first observed the growth but a short time before our first examination. Her attention was drawn to the eye by a slight impairment of vision. She is myotic and had been wearing glasses for years to correct this condition. In the left eye a granulation about the size of half a coffee-bean and of reddish color was seen in the upper-outer peripheral margin of the iris. The mass projected into the anterior chamber and in part filled out its angle. The pupil was somewhat irregular, vision slightly impaired, tension normal, slight ciliary injection especially in the region of the tumor.

Shortly after the eye was first seen, it was enucleated as a precautionary measure. In the enucleation the ocular conjunctiva was not dissected from the eye, but was removed with the eyeball; the importance of this was seen in the subsequent microscopic examination.

The patient made an uneventful recovery from the enucleation, and enjoyed good health for some time. Three years after the enucleation the patient died, and her physician, Professor Chambers, reported that her death was due to "cancer of the liver." There was no local recurrence, and we cannot say definitely that

the liver tumor was metastatic, though this is the most probable assumption.

Microscopical examination of the eye showed melanotic sarcoma of the iris involving the ciliary body (see Plate IV., Fig. 8).

Apropos of the statement of Drs. Friedenwald, in the above history, that "the ocular conjunctiva near the tumor was not dissected from the eyeball but was removed with it," and "the importance of this was seen in the subsequent microscopic examination," it is interesting to note, from our examination of the specimen, that in this specimen the tumor cells have perforated at the limbus, and that a large nest of sarcoma cells is found in the conjunctiva in this region (see Plate IV., Fig. 8). It is interesting, also, to note that the entire iris is infiltrated with tumor cells, and that even in the angle of the anterior chamber, opposite the site of the primary growth, tumor cells are abundant.

These findings undoubtedly prove the wisdom of the course followed in the treatment of the case, as expressed in the words of the report: "enucleation as a precaution." Another interesting finding, but one that we would expect, is the absence in this specimen of the ordinary indications of inflammatory reaction.

PROFESSOR KOMOTO'S CASE.

"Tokio, Japan, June 14, 1901.—I have reported this year in the Japanese journal of ophthalmology (*Nippon Jankasashi*, Bd. v., No. 6) a case of pigmented sarcoma of the iris, which seems to be the first case discovered in Japan. Dr. Kiribuci has written to me that it would be well to report the case to you, having forwarded to me the letter which you wrote to him. I have, therefore, decided to send the details to you."

Schioiciro Imamara, eleven years old, and the son of a farmer, was born in the village of Cognei, in the vicinity of Tokio. He is the second son, with father, mother, and brother in good health. Since early childhood he has had no illness worthy of note.

His eyes had always been sound until the beginning of September of last year, when there appeared something wrong with his left eye, for which he was treated by the village physician. As his symptoms did not improve, the boy's father brought him to an eye clinic. This was on the 22d of September, 1900. Upon

close questioning, it was found that since the 17th a dull pain had affected the eye and head, and that his eyesight had gradually failed.

Status præsens.—The patient is a healthy youth. The sound eye is emmetropic. The iris is blue. The diseased eye is hyperæmic about the cornea. The iris is, as a whole, markedly darker than that of the right eye. By indirect illumination one sees a tumor-like projection, which occupies the outer half of the iris, so that the pupil is crowded inward, and has a crescentic shape. The tumor is nearly spherical and almost touches the cornea. The cornea itself is somewhat opaque. The pupil is normal except for its altered shape. The interior of the eye can be well illuminated, but the papilla is not seen distinctly enough to say whether it is excavated or not. Vision is $\frac{20}{200}$. The eye is somewhat tender on pressure. Tension is clearly increased. Diagnosis: Pigmented sarcoma of the iris, with increased intraocular tension.

Enucleation was performed on the 24th of September and healing occurred without complications. The patient was discharged on the 14th of October, and has since returned several times for examination, but nothing unusual has been found.

The enucleated eye was hardened in formalin and sectioned. For microscopical study the specimens were freed from pigment and stained. It was found that the tumor was made up chiefly of pigmented round cells. The origin of these is the anterior layer of the iris; but since the spaces of Fontana are everywhere filled with the same cells, I could not decide definitely whether the pigment cells floated off the tumor and settled upon the surface of the iris and the lymphatic outlets of the anterior chamber, or whether the pigment cells of the surface of the iris—that is to say, the cells of the anterior reticular layer—were encroached upon by the tumor. But I am inclined to the former view, for both the pigment cells upon the iris, as well as those in the lymphatic spaces, are round cells.

The first figure (see Plate V., Fig. 9) shows that the pigment cells are not entirely freed from pigment. In the second figure (see Plate V., Fig. 10), much magnified, one sees clearly that the cells are round cells.

In Japan sarcoma is exceedingly rare. Among 35,000 patients, I have seen three cases of pigmented sarcoma of the choroid; of sarcoma of the iris one case, reported here. I have forgotten to

state that the field of vision was equally contracted upon all sides (to about 20°).

APPENDIX.

A. Szili, Jun., has sent to us the following history of the case of iris sarcoma that occurred in his father's practice:

The patient was a woman aged thirty-five, who stated that complete blindness of the right eye was observed only two weeks before. The eye presents the phenomena of chronic primary glaucoma, with clear media and deep total excavation of the optic disc. On closer inspection, there is to be observed in the inferior part of the otherwise light-brown iris a dark triangular spot, whose upper edge reaches almost to the pupil and whose base apparently overlaps the ciliary margin. This slightly prominent spot had a felt-like surface, which is very different from the thoroughly normal structure of the remaining iris. T. +2; V. 0. Diagnosis: neoplasm of the iris.

The eye being totally blind and there being no certainty that the intrusion of the tumor into the ciliary body could be excluded, the enucleation of the eye was proposed and performed.

The microscopic examination shows a fuso-cellular sarcoma, arising from the iris angle and overlapping the iris and a part of the ciliary body. Sclera and cornea were quite intact.

THE ANATOMY OF PRIMARY SARCOMA OF THE IRIS.

I.—MICROSCOPICAL APPEARANCE.

The microscopical appearance of a primary sarcoma of the iris can be determined only in those cases in which the affected globe was enucleated. The drawing from Denig's (see Plate III., Fig. 5) case well illustrates the conditions. Here the diameter of the base of the tumor is greater than the antero-posterior diameter, and the growth has a more or less regular outline. Outline drawings also illustrate the articles of Hirschberg, Helleberg, Kerschbaumer, Schiess, Mayweg, Wedl and Bock, Werther, and Komoto (see Plate V., Fig. 9), and present much the same picture as the drawing from Denig's case.

Ordinarily, one finds in descriptions of sarcoma of the eye, the expressions *diffuse sarcoma* and *circumscribed*

sarcoma. These terms are really only relative. The circumscribed sarcoma, as Kerschbaumer[1] says, "shows less tendency to grow on a plane surface." An absolutely circumscribed sarcoma of the eye is certainly a great rarity. Denig's case would have to be classed as a diffuse growth; in the other cases, where there are drawings of the tumors *in situ* (Hirschberg, Helleberg, etc.), the growths are diffuse. Sarcomas of the iris are in no sense circumscribed,—they are diffuse growths.

II.—HISTOLOGY.

Microscopically, sarcoma of the iris exhibits no material differences from the same neoplasm growing in other portions of the uveal tract; it develops under the same anatomical conditions, and shows like peculiarities; hence, an extended description of the histology of such a tumor is not necessary here. It is appropriate, however, to call attention to a few points.

It is an interesting characteristic of these tumors that, in nearly all cases, they consist of small round and small spindle cells. In the specimens that we have studied these are the predominating forms.

In considering the histological reports of these tumors, one finds frequently the statement that karyokinetic figures are absent, and that there is a noticeable absence of cells with two or more nuclei. In the histological specimens that we have studied, no mitotic figures were found. This evidence of a slow rate of growth is corroborated by the finding in the tissues at our disposal a tendency in the cells to arrange themselves in groups or in rows—alveolation. The tumors that we have studied have the appearance of the growth which is usually described in general pathology as fibro-sarcoma. These histological findings agree perfectly with the clinical observation of the usual slow growth of such tumors.

In these specimens, interesting and striking features were that the tissues showed no evidences of degenerative changes and very little inflammatory reaction. As to an inflammatory process, the one exception to this was in the case of

[1] Kerschbaumer, *Das Sarkom des Auges*, p. 31.

Coleman. In this case the tissue of the iris, in the parts adjacent to the region of more densely packed sarcoma cells, showed an irregular network of eosin-staining material with meshes that are often circular—the result, no doubt, of the coagulating action of the fixing fluid upon an inflammatory œdema; and in this exudate there were a great many polymorphonuclear leucocytes. These leucocytes were also found, but in fewer numbers, in sections showing densely packed sarcoma cells.

The cells of these tumors are usually said to take their origin from the stroma cells,—mesoblastic tissue,—and some authors speak of tumors arising in the anterior layers of the iris, others the posterior. Quite a few of these tumors have grown from congenital nævi—at least eleven cases. This is the proper place to call attention to the fact that Durante and Unna and, more recently, Abesser[1] and Larass[2] hold that the pigmented moles of the skin are of epithelial origin. If this is so, then it is possible that pigmented nævi of the iris are also of epithelial origin. And, if they are, we would have to adopt the term suggested by these observers, melano-carcinoma, at least, for those iris tumors that have had their origin in pigmented nævi.

While no mention is made of hæmangio-sarcoma of the iris, and there is no published report of such a tumor, it must be said that in three of the specimens we have studied the arrangement of the cells around the blood-vessels greatly resembles the arrangement usually described under the term peri-endothelioma (Borrmann).[3]

Leber[4] called attention to the fact that pigmented epithelial cells may multiply in sarcoma of the choroid, and that some of the pigment cells of such tumors may have their origin in these cells. In sarcoma of the iris we also notice a similar process.

The blood-vessels and blood-spaces of iris sarcomas do not differ in their structure from those of similar tumors arising

[1] *Virchow's Archiv*, 1901, vol. clxvi., p. 40.
[2] *Inaugural Dissertation*, Leipzig, 1901.
[3] R. Borrmann, "Zum Wachsthum und zur Nomenclatur der Blutgefässgeschwulste." *Virchow's Archiv*, 1899, vol. clvii., 2, p. 297.
[4] *Graefe's Archiv*, vol. xliv., 3, p. 683.

from other portions of the uveal tract, or, indeed, from those found in ordinary sarcoma.

Sarcoma of the iris is usually pigmented, although eleven cases are recorded as unpigmented. The character of the pigment does not vary from that of uveal sarcoma and it is distributed in the same manner. This is hardly the place to consider questions of the origin or chemical composition and properties of the pigment of melanotic sarcomas[1]—questions which are still subjects of contention.

There should not be much difficulty in distinguishing microscopically a sarcoma from a tubercle, a gumma, or from a nævus. The diagnosis will depend on well-known general histological facts.[2]

RELATIVE FREQUENCY.

We have histories of eighty-three cases in which the clinical diagnosis was confirmed by histological examination. In addition to these cases there are records of five or six cases in which the diagnosis can hardly be questioned. It may be said, then, that a most careful search shows that there are on record about ninety cases of primary iris sarcoma. We would, however, call attention to the fact that our collection of cases indicates that this condition is not nearly so rare as one might conclude from a perusal of previously issued monographs on this subject. We have records of eighty-three cases in which histological examinations were made; this almost doubles the number collected by recent writers on this subject. For example, Veasey,[71] in his collection has forty-four cases, while Werther[76] added twenty-three to Fuchs's sixteen cases.

If one considers the relative size and area of the iris and the choroid and compares the number of choroidal sarcoma cases with these ninety instances, the conclusion is forced upon us that, relatively, the iris is as often the seat of sarcoma as is the choroid.

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[1] See James Ewing, "Pathological Anatomy of Malarial Fever"; "The Malarial Pigments," *The Journal of Exp. Medicine*, 1902, vol. vi., p. 174.

[2] One of the authors of this paper (Dr. Pusey) hopes at a future time to present the subject of the minute anatomy and genesis of these tumors more thoroughly.

As to the frequency with which, in comparison with other eye diseases, iris sarcoma is found, no reliable statement can be made. Knapp has reported the greatest number of cases—four. It is fair to presume that this represents all the cases he has seen; it would be hard to estimate the number of clinical eye cases that Knapp has had under his charge and, therefore, the number of eye cases from which his iris sarcoma cases have come. We have had numerous letters from gentlemen who, with an immense clinical material both private and public, have never had a case of iris sarcoma; among these, for example, such men as Dr. Myles Standish, Prof. Groenouw, and Dr. Risley. There can, therefore, be no doubt but that sarcoma of the iris is one of the rarest of the eye lesions.

AGE.

The table given herewith shows the ages of patients affected with this disease. Twenty-seven cases were observed in individuals under thirty years of age, and fifty-seven after thirty years of age; which facts indicate that iris sarcoma is more common in the latter half of life. As will be seen later in this study, this point may be at times of some importance in differentiating between sarcoma and tubercle of the iris.

1–10	10–20	20–30	30–40	40–50	50–60	60–70	70–80	80–90	90–100
2	13	29	38	47	55	66	74		
7½	15	21	38	43	53	64	72		
6	16	23	36	49	53	67	75		
7	19	28	36	42	53	60			
	19	22	36	47	55	60			
	11	25	35	43	50	62			
	20	21	36	46	55	65			
	16	21	38	49	51				
	14	24	36	49	59				
	19	25	32	43	58				
	11	23	38	40	54				
		22	39	40	54				
			32	46	50				
				49	51				
				41	54				
				40	54				
				43	55				

SEX.

Of the cases in which the sex is recorded thirty-six were males and forty-five were females. If conclusions may be drawn from this number of cases, females are more often affected by primary iris sarcoma than males.

Apropos of the fact that this collection indicates that, probably, females are more often than males the subjects of sarcoma of the iris, it is instructive to refer to a recent exhaustive study of intraocular tumors of the optic nerve by Byers.[1] Byers collected ninety-eight such cases; of these, fifty-nine were in females and thirty-nine in males.

EYE ATTACKED.

Of the cases in which the side attacked is mentioned, thirty-three were in the left eye and twenty-eight in the right eye. In Carter's case both eyes were affected—one of the four or five instances in which sarcoma affected both eyes.

PRIMARY SITE OF THE GROWTH.

In thirty-five cases the primary position of the tumor was in the lower half of the iris; in thirteen cases, the upper half; in five cases, the inner side; and in two cases, the outer side. It is a curious fact that in such a large percentage of the cases the growth first appeared in the lower part of the iris.

In Fuchs's collection of cases, the primary position of the tumor was in the lower part of the iris in every instance except that of Fano. Zellweger" (in 1888) affirms that, almost without exception, the lower part of the iris is the primary site of the tumor, and commenting on this finding, says: "Es ist dies wohl mehr als eine blosse Zufälligkeit." The more recent cases, however, furnish a higher proportion in which the primary position is in the upper part of the iris; so that the finding of the primary position in the lower part of the iris was merely a coincidence in the early cases.

[1] W. G. M. Byers, *Primary Intradural Tumors of the Optic Nerve*. Montreal, 1901.

It is generally supposed that the world's inhabitants are about equally subject to sarcoma, but Prof. Komoto (see p. 334) says: "In Japan sarcoma is exceedingly rare. Among 35,000 patients, I have seen three cases of pigmented sarcoma of the choroid, and one case of sarcoma of the iris." This finding of Komoto is certainly unusual, and is worthy of note. It is interesting to contrast it with recent statistics of the largest eye hospitals of America and England—the New York Eye and Ear Infirmary[1] and the Royal London Ophthalmic Hospital,[2] respectively,— which show about eight cases of uveal sarcoma per 30,000 patients.

COURSE AND SYMPTOMS.

The clinical history of the course and development of an iris sarcoma is the same as that of any intraocular tumor. It usually resolves itself into four stages, in accordance with the classic description of Knapp.[3]

One of the most remarkable clinical points about the development of such a growth is the great length of time that it may exist without causing inflammatory symptoms — the first stage of development of an intraocular tumor. If one does not recall what is seen histologically in the tissues in the neighborhood of an iris sarcoma, it would seem almost impossible that such a growth could exist so long, and yet set up so little inflammatory reaction. The foregoing histories furnish numerous instances of the growth of tumors for months and even years without making the eye red and without interfering with the motility of the iris.

The most striking objective symptom of the *first stage* is a growing tumor, which is usually pigmented.

Iris sarcomas are frequently nodular, and often their blood-vessels may be seen. Sometimes several tumor masses show in the same iris. As is well known, in intraocular tumors the blood-vessels of the conjunctiva and sclera in the region of the growth may become engorged and prominent; such a condition was noted in Dr. Coleman's case and Schiess's first case.

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[1] *New York Eye and Ear Infirmary Reports*, 1901.
[2] *Royal London Ophthalmic Hospital Reports*, xv., 1899.

An interesting symptom, subjective and objective, which has frequently been observed in the first stage is recurrent hemorrhages into the anterior chamber. Such bleedings seem to occur spontaneously, and have several times been the cause of sending the patient to the doctor.

In the first stage there may be no subjective symptoms. Sometimes the tumors grow into the region of the pupil, and so interfere with vision.

In the second stage the typical case shows the symptoms usually exhibited by other intraocular tumors. Of the objective symptoms, of course, the most striking, as in the first stage, is that of the presence of a tumor in the iris. There is general injection of varying degree; there may be lachrymation. The cornea is often hazy from glaucoma. On Descemet's membrane there may be deposits. It may be well here to remind the reader that iris sarcomas have been clinically called "white tumors" (Kipp's case), that were histologically melanotic.

The iris in the region of the tumor may look muddy and "off color," while in other situations, even in the inflammatory stage, it will appear perfectly healthy and react normally to light and mydriatics. The use of the latter will frequently discover synechiæ behind the growth. The *tension* may be increased to any degree, or, as in Hosch's case, there may be no increase of tension. If intraocular tension has existed for a long time, there will be cupping of the optic nerve.

Of the subjective symptoms, the most important is that of decreased visual power, which may vary from slight obscuration—caused by intraocular tension—to blindness. Contractions of the field of vision—caused by glaucoma and invasion of the pupil by the tumor—are to be expected. The eye may be painful and there may be frontal and temporal headache.

The symptoms of the third and fourth stage are those due to the perforation of the walls of the globe and to the formation of metastases, such as are seen in any other intraocular growth, and consequently do not call for description.

DIFFERENTIAL DIAGNOSIS.

In the first stage of its development, a small pigmented sarcoma of the iris may easily be confounded with a *simple melanoma*. The point of greatest importance in the differential diagnosis between these tumors is the fact that a simple melanoma is stationary, while a sarcoma is a progressive growth. If the question should arise as to whether a suspected tumor is increasing in size, and is, therefore, sarcomatous, it would be proper to wait a while. A month or two would probably be long enough to settle this point. If the diagnosis cannot be made clinically by waiting, it certainly could be made promptly by examining the suspected growth histologically; it would be proper in a suspicious case to remove a portion of the tumor by iridectomy. Simple melanomas are congenital. This also is a point of great importance, but one must remember that the patient's evidence in such a matter is frequently very uncertain. A point of some importance is that a melanoma is usually more pigmented and, therefore, darker in color than a sarcoma. It is to be remembered, also, that simple melanomas do not, as a rule, project above the plane of the iris. In the second stage of its development there can be little trouble in differentiating between sarcoma and melanoma; a melanoma does not cause inflammatory symptoms or glaucoma. Of course, a patient with melanoma might exhibit inflammatory symptoms, due, for example, to syphilis; but such a case could probably be promptly decided by the history and the other symptoms. The same might be said of a possible combination of melanoma in an eye with inflammatory glaucoma due to other causes. If the question could not be otherwise settled, it would be proper to excise the suspected growth by iridectomy, and examine it histologically; in the case of acute inflammatory glaucoma with suspected melanoma the iridectomy would be the more indicated, for evident reasons.

The differential diagnosis from *gumma* and *tubercle*, in the first stage of the development of sarcoma of the iris, should offer no difficulty; a tubercle or gumma could not long exist in the iris without causing inflammatory reaction. In the

second stage some difficulty might be encountered in making a diagnosis. Here the history will be of great importance. At the first onset of gumma or tubercle there are inflammatory symptoms, while sarcoma may grow for weeks or months with no inflammatory reaction. In many cases sarcomas have developed from pigment spots which have been observed for years; the history may bring out such a fact. If the patient has had syphilis, the therapeutic test of the administration of mercury and the iodides on the growth may be resorted to. The existence of tuberculosis in other portions of the body should be determined. The age of the patient would be of some importance in differentiating between a localized tubercle and a sarcoma, and should be considered. Most sarcomas occur late in life while tuberculosis is rather an affection of adolescence. A suspicious circumstance would be a history of previous attacks of obscuration of vision; these would indicate sarcoma, for in a number of these cases there are histories of recurrent hemorrhages into the anterior chamber, and also glaucomatous attacks.

The appearance of the iris throws much light on the subject. In sarcoma the iris is usually swollen, muddy, and inactive to light and mydriatics only in the region of the growth; in tubercle and gumma, on the other hand, there are symptoms of severe and diffuse iritis, with haziness of the aqueous and probably hypopyon. It is a fact that hypopyon is not mentioned as present in a single case of iris sarcoma. In many instances of the latter there have been multiple points of growth visible (*e. g.*, our case, Hubrich's, Alt's second case, and in the case of sarcoma of the iris and ciliary body recently reported by von Rechtperg [4] from Fuchs's clinic). This fact must be remembered, and it is spoken of here particularly because different authors have made the statement that multiple tumors indicate tuberculosis, and have said that such a condition is of great value in differential diagnosis (for instance, Fuchs's *Das Sarcom des Uvealtractus*, p. 232).

Most sarcomas of the iris are pigmented; hence the dark appearance of a suspected growth points to sarcoma, but it

must be remembered that some sarcomas are non-pigmented, and even some pigmented sarcomas have appeared to be "white" clinically. On the other hand, a small gumma situated in a dark iris with its engorged vessels may seem quite dark in color. The value of the appearance of the growth in diagnosis may also be destroyed when the tumor is seen through a hazy cornea.

The degree of inflammation is of much importance; gumma and tubercle cause the greater reaction.

A statement said to be of differential diagnostic value between tubercle and sarcoma is that the latter seldom or never perforates at the limbus (Kerschbaumer).[1] Yet in one case (Friedenwald's) perforation did occur at the limbus.

If, after a consideration of the clinical points just enumerated, and especially if the tumor does not disappear under anti-syphilitic treatment, the diagnosis is still unsatisfactory, we would advise the removal of the growth and its examination histologically.

At the New York Eye and Ear Infirmary, Dr. Pusey saw a lens dislocated into the anterior chamber, which might have been confounded with an iris sarcoma. The patient was an unintelligent woman, who spoke one of the dialects of Eastern Europe, so that no history was obtainable. The eye was glaucomatous, and behind the hazy cornea a small ($\frac{1}{3}$ the size of the normal lens) whitish mass was seen lying on the iris downwards and inwards. It looked very much like a tumor, but the fact that the iris was slightly tremulous and lay unusually far back, making a very deep anterior chamber, attracted attention. The diagnosis was plain when the patient was made to lie down and move the head, for then the mass moved about in the anterior chamber.

ETIOLOGY.

The etiology of sarcoma of the iris is that of sarcoma in general, or, at any rate, of *pigmented* tumors. This is not the place to consider such a subject at length—a subject which is just now engaging the attention of pathologists the world over.

[1] *Das Sarkom des Auges*, Wiesbaden, 1900, p. 36.

A fact that especially attracts our attention, and which may be best noted here, is the development of these tumors from congenital pigmented nævi. In ten cases (or 11.62 %) (Charnley,[19] Hirschberg,[25] Hosch,[29] Schiess,[62] v. Hippel,[72] Whiting,[77] Wiegmann,[78] Fick,[17] R. Sattler, and Hotz's first case) there is a clear history from early youth, of pigmented lesions from which subsequent sarcomas developed. This is a large percentage of cases; it is, however, probably not the correct percentage in which sarcomas have taken their origin from congenitally pigmented areas. It is probably much too low. In seventeen other cases there is a history of a spot on the iris, which had been noticed for varied and uncertain lengths of time before it began to grow. There is such a history in Andrews's[4] first patient, where the spot had been noticed for five or six years; and in Andrews's[5] second patient, where the spot had been noticed for a "long time"; in Buffum's,[8] eight years; Collins's,[11] four and one half years; Ewetzky's[16] second case, nine years; Kipp's,[33] twelve years; Knapp's[36] second case, "many" years; Knapp's[35] third case, ten years; Krükow's[39] seven years; Lawford and Collins's,[40] three years; Mayweg's,[46] sixteen years; Oemisch's,[48] five years; Pflüger's,[51] six years; Pflüger and Horner's,[52] ten years; Solomon's,[64] twenty years; Veasey's,[71] eight years; and Nelson and Thompson's, twelve years. As will readily be granted, all the probabilities are that the statements regarding the length of time these spots had existed are not accurate; it is more than probable that the pigmentations, in many instances, were congenital, but had not been noticed until something attracted the attention of the patient to them, and the patient had dated their existence from the time of such observation. This being the case, the percentage of cases in which the tumors have grown on preëxisting pigment lesions should be largely increased. It must not be forgotten, however, that, possibly, in some of these last-mentioned eighteen cases, the "spots" were really the sarcomas themselves, for it is a well-known fact that these tumors may grow exceedingly slowly.

It probably is a fact that pigmented nævus of the iris is in

every way similar to the same tumor in the skin; it certainly is a fact that, clinically, a pigmented nævus of the iris should be regarded by the ophthalmic surgeon with as much suspicion as a pigmented mole in the skin is observed by the general surgeon, and there is no better place in this paper than this to say that such a growth in an eye, associated with inflammatory or glaucomatous symptoms, should arouse suspicion and be dealt with accordingly.

In the case of Schneider,[63] a brown spot was noticed five months after an injury; six years later a tumor developed on the brown spot; in Helleberg's[38] case, there was an inflamed eye from a blow four years before the tumor developed; in the cases of Thalberg[68] and of Walker,[71] the tumors developed in eyes from which cataractous lenses had been extracted; in the case of Sattler and Krückmann, an iridectomy had been done on the eye for inflammatory glaucoma; in Coleman's case there was a history of injury six years before the development of the tumor. These are the only cases in which there is a history of preëxisting inflammation caused by traumatism. By way of comment, it may be said that this is a very insignificant number when compared to the total number of iridectomies, cataract extractions, and similar injuries in this region.

In contrast to the fact that sarcomas of the choroid have been known to develop in atrophic globes—indeed, seem to have a predilection for such eyes, it is interesting to notice that there is no recorded case of sarcoma developing in the iris of such an eyeball.

PROGNOSIS.

The surgeon will be called upon for a prognosis, not only as regards the eye, but the life of the patient.

On the subject of retaining an eye afflicted with a sarcoma of the iris, the authors would refer the reader to the classification of cases under the heading of treatment. In that classification, it will be seen that in four cases iridectomy was done, and there was no apparent recurrence of the disease for "five years," "many years," "four years," and "eleven years," respectively.

As regards the life of the patient, the prognosis in iris sarcoma is the same as in all sarcomas; safety depends on the early and complete removal of the growth.

TREATMENT.

There has never been any difference of opinion as to what should be done when such a growth is met with. Nobody has denied the proposition that a sarcoma of the iris should be removed as soon as the diagnosis is established; but what constitutes *effective* removal has given rise to great differences of opinion, and these differences have been the main cause of our undertaking the work herewith presented.

An idea of the varied advice to be found on the subject of treatment may be gotten by reading a few monographs and articles upon this subject.

Fuchs[1] says that iris sarcoma may be excised by iridectomy if it be small enough to be entirely removed. Pflüger practically affirms the same thing when he says that the prognosis, so far as the eye is concerned, is good as long as the sarcoma is limited to the iris. Oemisch, Veasey, and Knapp treated their cases by iridectomy.

Andrews, in writing of his last case, says: "It is impossible to determine in a given case whether the ciliary body is involved." Kerschbaumer[2] says that from her observations, from the literature, and her own cases, she must deny that we are right in retaining the globe when an iris sarcoma exists, and says: "So wenig ein Chirurg bei Carcinoma Mammæ nur eine lokale Extirpation eines Carcinomknotens ausführen wird, ebenso wenig sollte ein Ophthalmolog bei Augensarkomen nur eine lokale Operation vornehmen." Werther[3] advises as the only treatment the enucleation of the globe.

Fuchs's advice has been widely quoted and has probably been the cause of misunderstanding, and possibly harm, inasmuch as his dictum has been construed as favoring re-

[1] *Das Sarcom des Uvealtractus*, Wien, 1882, p. 282.
[2] *Das Sarkom des Auges*, Wiesbaden, 1900, p. 252–253.
[3] Werther. "Ueber das Sarcom der Iris." *Archiv f. Augenheilk.*, xxxii., p. 303.

moval by iridectomy, although he distinctly says that iridectomy is only to be done when the tumor can be *entirely* removed by such an operation. His statement on the subject can only be interpreted as meaning that, at times, sarcoma can be recognized as localized in the iris, and then it can be removed by iridectomy.

The question before us is: Can we determine clinically that a particular growth is limited to the iris? We are assisted in coming to a conclusion by a consideration of the cases that have been observed.

It is hardly necessary to state the fact that this is an important subject. On the one hand, there is the chance of preserving an eye — removal by iridectomy; on the other, the possibility of endangering the life of the individual by failure to remove the whole tumor. In some of these cases the surgeon's responsibility is lightened by the fact that the growth has already seriously impaired the eye as a visual organ; every one will grant that in such a case the question of treatment is simple.

The recorded cases, as regards the histological findings and the results of treatment, may be conveniently classified, and light from these is thrown on the subject of treatment generally by considering (1) the cases in which enucleation was done—the histological findings and (2) the cases in which iridectomy was done—the after-history and the histological findings. A classification has been made as follows:

ENUCLEATION (E1).

Histological Examination of the Globe Showed Involvement of Other Parts than the Iris.

Adams[1]	Secondary deposits in ciliary muscle.
Alt (1st case)	Ciliary body involved.
Andrews (2d case)	Growth extended beyond iris.
Buffum	Globe involved.
Collins	Region of canal of Schlemm and ciliary muscle and processes involved.
Ewetzky	Secondarily in ciliary body.
Helleberg	Ciliary body involved.

[1] See the abstracts of these cases.

GRIFFEN.....Ciliary body involved.
GRUENING.....Ciliary body involved.
HIRSCHBERG.....Tumor was adherent to lens.
KERSCHBAUMER.....Ligamentum pectinatum and Schlemm's canal involved.
KERSCHBAUMER.....Ciliary body involved.
KNAPP (4th case).....Tumor could not be separated from its attachment to the inner wall of Schlemm's canal.
LEBRUN.....Ciliary body involved.
LIMBOURG.....Ciliary body involved.
MARSHALL.....Tumor in contact with ciliary body.
ST. JOHN.....Ciliary body involved.
SCHIESS (1st case).....Ciliary body involved.
SOLOMON.....Pectinate ligament and ciliary body involved.
THALBERG.....Tumor attached to Descemet's membrane.
WALKER.....Growth attached to Descemet's membrane.
WEBSTER and VAN GIESEN.....Ciliary body involved.
WEDL and BOCK.....Ciliary body involved.
WERTHER.....Schlemm's canal, pectinate ligament and ciliary body involved.
WERTHER.....Schlemm's canal, ciliary muscle and processes involved.
WILLIAMSON.....Ciliary body involved.
SMITH.....Ciliary body involved.
NELSON and THOMPSON.Ciliary body involved.
ROBERTSON.....Ciliary body involved.
ROGMAN.....Ciliary body involved.
SATTLER and KRUCKMANN.....Ciliary body involved.
From Prof. SCHNABEL'S Clinic.....Pectinate ligament involved *in toto*.
SCHULCH and VON GROSZ.Two years after enucleation, recurrence of growth in orbit.
SCHULCH and VON GROSZ.Patient died of metastases.
ROMIÉE.....Cornea involved.
QUAGLINO and GUIATA.Capsule of lens involved.
FANO.....Sclera infiltrated.

LAWFORD and COLLINS. Ciliary body involved.
DENIG..... Ciliary body and processes involved.
FRIEDENWALD..... Ciliary body and sclera involved.
KOMOTO..... Spaces of Fontana and ciliary body involved.

ENUCLEATION (E2).[1]

Histological Examination of the Globe Showed Involvement of Other Parts than Iris.

SCHIESS (2d case, "Fall 4")..... Bulb nearly filled with sarcoma.
VON HIPPEL..... Bulb is filled with tumor.
WHITING..... Involving choroid.
RANDOLPH..... Two years after enucleation death from metastasis.

ENUCLEATION (E3).

Histological Examination of the Globe Showed Possible Limitation of Growth to Iris.

EDSALL..... "So far as I can recall, no invasion of any part of eye except iris." From a letter written four years after the case was recorded.
ROBERTSON and KNAPP. "Removal of the whole iris might have been sufficient in this case."

ENUCLEATION (E4).

Histological Examination of the Globe Showed Limitation of Growth to Iris.

ALT (2d case)..... The whole of the iris involved.
ANDREWS (1st case).... In the stump — after iridectomy — there were cells which looked not unlike the cells of the tumor.
HOSCH..... The tumor has left other parts of the uvea intact.

[1] These cases are put in a class by themselves, because of the fact that, at the time the diagnosis was first made, operation was not allowed, and we, therefore, cannot draw conclusions from them.

ENUCLEATION (E5).

No Report Concerning Involvement of Other Parts than the Iris.

DRESCHFELD.
PANSIER.....Iridic tissue about the tumor is filled with cells.
SAUER.
SCHNEIDER.
TAY.
COE.
SATTLER, ROBERT.

IRIDECTOMY (I1).

Histological Examination of Removed Tissue Shows the Incision for Removal made through Tissue Invaded by Tumor Cells.

AUTHORS' case.
Dr. COLEMAN'S case.
HOTZ'S 1st case.

IRIDECTOMY (I2).

No After-History, or Indefinite as to Time.

CHARNLEY.....Author was of opinion that tumor would recur.
PFLÜGER.....Reported a few months after operation.
SMITH.....No history of recurrence.
SMITH.....No recurrence.

IRIDECTOMY (I3).

Case under Observation One Year or Less.

CARTER.....A fresh tumor appeared after iridectomy.
KNAPP (1st case).....Remained under observation about one year; eye free of irritation.
KNAPP (3d case).....Reported three months after operation. "The parts of iris adjacent to tumor were to a certain extent infiltrated with nuclei like those in the tumor."
OEMISCH.....Four months later there was no return of the growth.

VAN DUYSE and VAN SCHWENSTEEN. ....No recurrence three months after operation.

WIEGMAN.....Eight months after iridectomy growth reappeared in scar and was cauterized; at time of closing history there were light brown spots in iris.

ZELLWEGER.....No change in eye, but the patient was well. "It is possible that a metastasis has taken place in the internal organs."

HALE.....Reported four months after operation.

IRIDECTOMY (14).

Case under Observation Two Years or Less.

FICK.....Thirteen months after operation, no recurrence. In this case the pathologist who examined the tissue (Prof. Ribbert) gave an unfavorable prognosis. (Private letter from Prof. Fick.)

HOTZ.....No recurrence after two years.

IRIDECTOMY (15).

Case under Observation Three Years or Less.

KNAPP (2d case).....During the three years since the operation, two very mild attacks of iritis.

PFLÜGER and HORNER..After about three years the eye and general condition showed nothing of interest.

EWETZKY (2d case)....No recurrence after three years. (From private letter.)

THOMPSON, A. H.....No recurrence after two years and two months.

IRIDECTOMY (16).

Case under Observation More than Three Years.

KIPP.....Five years after operation no return. Man was killed in an accident.

KRÜKOW.....In 1884 iridectomy. Reported in 1886 that the patient was seen more than one year after the operation, and showed no return (*Westnik Ophth.*, 1886, i.). In 1895 enucleation; ciliary body and remainder of iris found infiltrated by tumor cells (Ewetzky, *Graefe's Archiv*, xlv., p. 600, Case 8). In 1900 the patient died of general sarcoma—lungs, liver kidney, etc.—as shown by autopsy. (from a letter to the authors from Prof. Krükow).

LITTLE.....A personal letter from Dr. L., January, 1901, says: "In this case there was no recurrence after many years."

MAYWEG.....A personal letter from Dr. M., May, 1901, four years after the operation, says: "To date there has been no return of the growth."

POST.....After eleven years no recurrence (private letter).

VEASEY.....A personal letter from Dr. Veasey, March, 1902, four years after the operation, says: "Not the least sign of recurrence."[1]

To recapitulate, enucleation has been done in fifty-seven cases. Of these, in seven—class E5—we have no data from which to draw conclusions, while four — class E2—are left out for reasons that have been stated. The reader is referred to the notes on the five cases in classes E3 and E4, but the authors would call particular attention to Alt's second case and Hosch's case. The latter stands out very boldy. Eliminating these classes and their sixteen cases, there is left class E1 and *forty-one cases in which the histological examination*

[1] In compiling the tables given above, the authors' attention has been forcibly drawn to the lesson as to treatment to be learned by the histological study of the tissues, and they would respectfully suggest that hereafter, when an eye is removed for iris sarcoma, a very careful description be given of the surrounding parts, particularly of the pectinate ligament, the canal of Schlemm, and the ciliary body; and when an iridectomy is done, note should be made of the presence or absence of tumor cells in the tissues adjacent to the tumor.

of the enucleated globe showed involvement of other parts than the iris.

Iridectomy has been done in twenty-seven cases. The results in the three cases of class I1 can certainly be said to be bad. The notes on the nineteen cases of classes I2, I3, I4, and I5, form interesting reading; in some of them the continued growth of the tumor is only too evident. By way of comment the authors would remind the reader that the growth of these tumors is usually exceedingly slow, warning one not to be too certain of a cure until a long time—more than three years—has elapsed after removal. In class I6 we come to the cases which were followed for more than three years after iridectomy. Little's and Post's cases can be called successes. Kipp's case was probably a success, but, after reading the story of Krükow's patient returning for treatment eleven years after iridectomy, one wishes that Kipp's patient had not been killed, so that further observation could have been made. Mayweg's and Veasey's cases have not been observed long enough to say the last word on them. The case of Krükow needs no comment.

The authors are of the opinion that further remarks on the foregoing findings are not necessary. The facts stand out boldly, they are clear and, as regards treatment, lead only to one conclusion: *When the diagnosis of iris sarcoma is established, the globe containing the growth should be immediately enucleated.*

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SUPPLEMENTARY NOTE.

In the June number of the *Klinische Monatsblätter für Augenheilkunde* (1902, xl., p. 465), which was received after this paper had gone to press, is an article by M. MEYERHOF, entitled **Weitere Untersuchungen an Sarkomen des Ciliarkörpers und der Iris.** In it the writer records a hitherto unpublished case of sarcoma of the iris, numbered as Fall vii. (p. 485), **Primäres melanosarkom der Iris, auf den Ciliarkörpers übergreifend. Ringform. Unterschiede der Pigmentierung.** The microscopical examination of the enucleated globe showed that the cells of the tumor consisted in great part of pigmented spindle and polygonal forms. They had widely invaded the neighboring structures: cells grew on the posterior surface of the cornea and on the anterior capsule of the lens; the pectinate ligament contained tumor cells, as did the ciliary body, and even the choroid and sclera in places.

No clinical history of the case was obtainable.

Author.	Age. Sex.	History.	Condition when First Seen.	Condition at Time of Operation.	Tension.	Vision.	Primary Position of Tumor.	Operation.	Microscopical Examination of Iris and Globe if Enucleated.	Remarks on Treatment —Later History of Case
1. Adams.	13. F.	L. E. A particularly well-grown child. No indications of syphilis.	In deeper layers of cornea are opaque spots, which are exactly like those of "punctate keratitis." Post. synechia below and in. In lower-outer part of A. C. there is a round, brown mass, about size of 2 ordinary pinheads, which are quite smooth on surface. Lower part of tumor concealed in receding angle. No vessels visible on its surface.	The appearance on first examination led to the suspicion that the case was one of unusual form of specific kerato-iritis, and treatment accordingly was followed for several weeks. No improvement. Original mass increased in size; another smaller one close by its side. A few vessels are now visible on surface of large tumor.				Enucleation.	Round-celled sarcoma; attachments to cornea and secondary deposits in ciliary muscle.	"Some of my colleagues advised attempts at removal by iridectomy. But feeling confident of my diagnosis and remembering the case of Carter, I adhered to my own opinion and enucleated. Microscopical examination showed that any attempt to save the eye would have been worse than useless."
2. Alt.	29. F.	L. E. Failure of vision and pain in eye during four years. Repeated attacks of what is judged to have been iritis. During the last year the eye has been continually inflamed.	V = fingers at 2 feet. Great pain; double injection; iris discolored; pupil small and irregular and is filled by an iritic membrane; iris attached to the lens. In the angle in the middle of the lower quadrant there is a minute dark spot, which is just raised above the level of the surrounding tissue.	The tumor was taken for a gumma, and vigorous antisyphilitic treatment was given. The inflammatory symptoms subsided, but the tumor remained unchanged. Six weeks later the inflammation returned accompanied by pain and increased tension.			Lower quadrant.	Iridectomy. Enucleation.	Unpigmented spindle-celled sarcoma.	It was impossible to remove the tumor because of its peripheral position. The tumor grew and the eye was removed. The iris tumor was in connection with a larger one in the ciliary body.
3. Alt.	2 F.	R. E. Parents healthy.	Slight double injection; pupil very small and the iris is attached to cataractous lens. Iris nodular and swollen. There are a number of nodules; two are especially large. No swollen glands. L. E. normal.	During three weeks was treated with mercury and atropine, which had no influence. The swelling of the iris increased; more injection. Two staphylomatous elevations of sclera in ciliary region.	+ 2			Enucleation.	Round-celled sarcoma, which involved the whole of the iris. Origin probably in loose parenchymatous tissue of the membrane.	
4. Andrews.	47. F.	L. E. Discoloration at site of tumor has been noticed for at least 5 or 6 years. About 15 mos. ago sight of left eye became obscured, condition lasting a day or two. Periodical obscurations of vision frequently since then.	Slight double injection. Pupil dilates under atropine. No corneal opacity. Lens, vitreous, and fundus normal. Growth appears to spring from anterior aspect of iris. It is lobulated and vascular.			$\frac{20}{100}$		Iridectomy. One week later enucleation.	In the stump of the iris in the globe there is an infiltration of cells, which look not unlike the cells near the tumor in that part of the iris, which was removed by iridectomy.	After the iridectomy there was considerable inflammatory reaction. The author claims that the tumor was entirely removed by the iridectomy.
5. Andrews.	43. F.	Growth had been noticed for a long time.	Circumcorneal injection; no pain.			Not disturbed.		Enucleation.	Because of the extension of the sarcoma beyond the reach of an iridectomy, any attempt at excision by iridectomy would have failed.	"It is impossible to determine in a given case whether the ciliary body is involved."
8. Buffum.	55. F.	R. E. Eight years ago noticed peculiar appearance of the eye. During this time there have been occasional attacks of pain and inflammation; these attacks have increased in frequency. Vision has been less after each attack until sight disappeared. Last attack 3 weeks ago, and since then pain has continued.	Double injection. Pupil irregular. Lower portion of iris gray; upper part, which seems almost in contact with the posterior surface of the cornea, is brown, with dark spots upon its surface. Lens hazy and fundus cannot be seen. Pain around the eye.		+ 2.	0.	Upper $\frac{3}{4}$ of iris.	Iridectomy when fully $\frac{1}{4}$ of the iris was removed. Three months later enucleation.	Microscopical examination of excised iris showed pigmented spindle-celled sarcoma. Examination of globe showed it to be nearly filled with sarcoma cells.	The enucleation was done because of renewed inflammatory attacks. Patient died 18 months later; diagnosis of pneumonia, but there was no post-mortem examination.
9. Carter.	15 M.	Both eyes. Healthy lad, of good family history. Three weeks before admission to hospital he noticed a small speck on the iris of left eye, which steadily increased in size. Two weeks before admission two similar specks appeared in the right eye and also increased in size.	In left iris, lower portion, there is a tumor the size and color of a split pea, extending to the margin of A. C., and encroaching upon the pupil and lying in contact with inner surface of the cornea. Tumor is covered by fine network of blood-vessels. The rest of iris appeared healthy. Zone of fine injection around cornea. In the right eye were two small growths of similar character, springing from the outer part of the margin of iris, but the eye was in other respects healthy and the vision was unaffected.					Iridectomy on left.	Round-celled sarcoma.	After operation on left eye a fresh tumor appeared at outer margin of iris.

Author.	Age. Sex.	History.	Condition when First Seen.	Condition at Time of Operation.	Tension.	Vision.	Primary Position of Tumor.	Operation.	Microscopical Examination of Iris and Globe if Enucleated.	Remarks on Treatment. Later History of Case
10. Charnley.	16. M.	R. E. Eleven years ago consulted an oculist about the growth. For many years after the tumor remained unchanged; lately red spots appeared on it, and there has been occasional obscuration of sight. General health good; family history negative.	There was a small hemispherical tumor about $\frac{1}{16}$ inch in diameter. Iris gray. The tumor projects well from its surface and it is brownish-gray in color; it is vascular. Iris movable; fundus normal.	Eighteen months later dimness of sight. Tumor has certainly increased in size. There is an effusion of blood in A. C., occurring without shock or blow.		$\frac{6}{6}$	Lower-inner quadrant.	Iridectomy.	It has much the appearance of ordinary spindle-celled sarcoma; there is yet a difference, for in many places there is fairly developed fibrous tissue. There are blood-vessels with imperfectly developed walls.	"Is the tumor likely to recur? One would say it almost certainly would."
11. Collins.	21. M.	L. E. First noted trouble 3 years ago; since then tumor has gradually increased in size. Formerly the iris was blue; it has become more of a green color. "He has never had any inflammation in the eye, nor has he at any time received any injury to it." Vision always good. A photograph taken 4½ years ago shows a dark spot down and out on iris.	Some ciliary injection. Cornea clear; pupil active, but shows some irregularities in its margin. Iris greenish. Down and in at the pupillary margin there is a rounded brown projection. Lens clear; fundus normal.	Five days after first examination the eye was removed.		$\frac{6}{6}$	Outer-lower part.	Enucleation.	On the anterior surface of iris a layer of closely packed, small round cells, with very little intercellular substance. These cells invade the cornea, and are in and around the canal of Schlemm and also lie on posterior surface of Descemet's membrane. Some spindle cells. Ciliary muscle and processes are infiltrated with groups of round and spindle cells. The tumor is pigmented in patches.	
12. Dreschfield.	53 F.	L. E. Subject of rheumatism and always of indifferent health.	There was a hemorrhage into A. C.; otherwise the eye was normal. After two weeks, seen again, when the blood was absorbed. Fundus healthy. Vision good.	Three years later was seen again with history of three attacks of hemorrhage into A. C. On close examination tumor was found, which was size of a split-pea and reddish-gray in color. Eye painful.		Dim		Enucleation.	Spindle-celled melanotic sarcoma.	Dr. D. Little of Manchester, England, in whose practice this case occurred writes: "January, 1901 Dr. D. L. saw this patient fifteen years after the operation, and there was no recurrence."
13. Edsall.	23. F.	L. E. Two years ago noticed growth in iris. Tumor has increased in size, and for several months there have been attacks of pain. General health good; personal history negative.	Tumor about the size of a split-pea. Dark gray in color. Frequent hemorrhages have occurred into A. C.	Diagnosis of sarcoma, but the possibility of gumma suggested the short use of mercury and K. I., which was without results. The tumor possibly increased in size.	+	$\frac{20}{30}$	Temporal side midway between scleral and pupillary border.	Enucleation.	Small spindle-celled sarcoma.	A letter written in 1901 says: "So far as I can recall, there was no invasion of any portion of eye except iris."
14. Ewetzky.	38. M.	L. E. Acquired syphilis two years ago. For two weeks has complained of pain in left eye.	Slight pericorneal injection. Back of the cornea there is a tumor, which bears on the lens and pushes the iris forward to the cornea. V = 1/3 T. n. Put on specific treatment, but no change. Fifteen months later tumor has become larger. V = fingers at ten feet. T. n. Patient was told that enucleation was necessary when he disappeared.	Three years later the tumor has become still larger. On the upper border of the cornea in the sclera, under the conjunctiva, there are two miliary spots. V = o. T +.				Enucleation	Pigmented, round- and spindle-celled sarcoma; secondarily in ciliary body.	
15. Ewetzky.	28. M.	R. E. Nine years ago a bright yellow spot was noticed where tumor now is. Four or five years later a black spot appeared in the middle of the yellow spot and began to grow, and from this the tumor has developed. Lately the tumor has grown rapidly.	Tumor is the size of a bean and occupies the entire breadth of the iris and projects over the pupillary border. The tumor extends forward to the cornea; it is dark brown in color. Pupil reacts; it is irregular. Fundus normal. No inflammatory symptoms; no pain.		Normal.		Upper-inner quadrant.	Iridectomy by Prof. Krûkow.	Tumor consists principally of small round cells, with some spindle cells. Many cells are pigmented.	A letter from Prof. Krûkow says: "No return of growth at least up to date of report, August, 1901."
16. Fano.	19 M.	Has had trouble for three months; no cause given.	Ocular conj. moderately injected. A tumor in upper-inner portion of cornea, size of a lentil and reddish-white in color. A portion of the tumor was excised.	One month later the eye was excised.		P. l.		Enucleation.	Tumor mass contained connective-tissue cells, some in process of formation. Some of the cells were pigmented. Sclera infiltrated.	No return after six months.
21. Griffin.	19. F.	L. E. Failure of vision dated back only 3 weeks. No history of injury.	The tumor pushed the iris against the cornea. As seen through the pupil the tumor appeared white and opaque, and its surface was slightly irregular. Pupil mobile and reacted to light. No pain or signs of inflammation.		Not increased.	Fingers at two metres.	Lower-outer quadrant.	Enucleation.	The growth arose in the posterior layers of the iris. Ciliary body was involved. Small spindle-celled sarcoma traversed by numerous irregular bands of hyaline or myxomatous degeneration.	

Author.	Age. Sex.	History.	Condition when First Seen.	Condition at Time of Operation.	Tension
23. Gruening.	11. M.	L. E. According to mother the spot had been noticed for four weeks.	A reddish-yellow mass growing from iris. This mass composed of three yellow nodules, which sprang from a common red base. Pupil dilated; atropine. Slight double injection. Media transparent. Fundus normal. In order to establish the nature of the growth, enough of the tissue was removed to examine microscopically.	After the iridectomy the wound did not close, the mass became visibly larger. Enucleation.	
24. Hale.	23. F.	R. E. The patient was well nourished and healthy; no history of syphilis or tuberculosis. For 3 weeks the eye had been painful.	A small tumor was visible within the iris. The iris was freely movable. Under atropine the tumor became more prominent. Large doses of potassium iodide were given for three days, with no effect.	Just four weeks after pain had begun, the tumor as a whole was withdrawn, through a corneal incision and excised. Healing normal.	
26. Helleberg.	40. M.	R. E. About five years before appearance had a blow on the eye; following this the vision decreased and the eye was inflamed, which disappeared in a few weeks and the vision returned to normal. Vision remained normal until eight months ago when it was noticed that the right eye did not see as well as the left. Six months ago the vision became so poor that he could only recognize objects near the eye. Pain in the eye drove the patient to the clinic three months ago.	Below and on outer side the iris was pressed forward and in this region there were fine vessels. Between the iris and lens there was a tongue-like pigmented formation. T. was increased. Papilla totally excavated. V = fingers at ½ metre. Patient refused enucleation.	After three months came again to clinic and requested enucleation. The eye was practically blind and there was pain in the eye and head. Slight double injection, cornea transparent. Pupil did not react to light.	+
28. Hirschberg.	38. M.	R. E. Patient had always been well. During a year has noticed a black new-formation in the iris. This began on a place where from youth there had been a dark spot. During the last weeks the increase in size has been particularly rapid. General health good.	The growth is not accompanied by pain, redness, or other inflammatory symptoms. The A. C. is in great part filled by a dark mass, which grows from the iris, and which in color is dark brown. The part of iris free of tumor appears normal.		
29. Hosch.	66. M.	R. E. In the iris of this eye there had been a brown spot since youth. Recently this eye has had a feeling as if there were a foreign substance in it.	T. normal. V. = $\frac{15}{15}$. Conjunctival injection below. A brown tumor in lower part of A. C., which pushes iris backwards. The tumor reaches the middle of the pupil. Media clear. Advised enucleation and the patient laughed.	Six months later returned complaining of pain and that the eye was always red. Pericorneal injection. The tumor is larger and shows numerous vessels.	Normal.
30. Hubrich.	54.	L. E. The growth might have sprung from a pigmented nævus.	In the iris there is a black tumor; in other portions of the iris there are other black spots. In the sclera there are two irregular black masses in the outer-lower portion.		

Vision.	Primary Position of Tumor.	Operation.	Microscopical Examination of Iris and Globe if Enucleated.	Remarks on Treatment—Later History of Case.
Normal.	Below.	Iridectomy for diagnosis. Enucleation.	By Dr. Geo. S. Dixon. Sarcoma of round- and spindle-cell variety. Ciliary body involved.	
	Outer-lower quadrant.	Iridectomy.	Melano-sarcoma.	Four months after iridectomy patient was last seen, when there was no pain, the iris was freely movable, the coloboma was clear, and there were no traces of tumor.
c.	Below and temporal side.	Enucleation.	The tumor in cross-section extended from pupillary edge nearly to the ciliary body. It had its origin in the posterior layers of the iris. The ciliary body was invaded. The author says that the tumor is to be classed as an unpigmented tumor; it contained some pigment cells, but he considered these as preformed iris pigment cells.	
[illegible]	Lower half of iris.	Enucleation.	Pigmented spindle-celled sarcoma. Tumor was adherent to the lens.	Six months after the operation, patient presented himself to "express his thanks at being cured."
$\frac{15}{100}$		Enucleation.	Pigmented spindle-celled sarcoma springing from iris; other parts of uvea intact.	
	Lower-inner quadrant.	Enucleation.	Melanotic spindle celled sarcoma. The sarcoma cells have infiltrated the lamellæ of the cornea at the limbus. Canal of Schlemm destroyed.	

Author.	Age. Sex.	History.	Condition when First Seen.	Condition at Time of Operation.	Tension	Vision.	Primary Position of Tumor.	Operation.	Microscopical Examination of Iris and Globe if Enucleated.	Remarks on Treatment—Later History of Case.
31. Kerschbaumer.		No clinical history.					Lower part of A. C.		The tumor filled nearly ⅔ of A. C. It was attached to the posterior layer of the iris, and was so intimately connected with the posterior pigment layer that they could not be separated. The iris in places was free from tumor, and it showed wide-gaping, numerous vessels and blood extravasations. The neoplasm filled the posterior chamber and dislocated the ciliary processes; these, as also the ciliary body, were free from the tumor. The canal of Schlemm and the ligamentum pectinatum were invaded by the tumor cells.	
31. Kerschbaumer.	36. M.	L. E. About three years before examination the patient noticed a dark spot in the iris; at that time it was about the size of a millet seed. Since then it has grown rapidly.					Inner side.		Tumor takes up ⅓ of A. C. The tumor cells are partly round, partly polygonal, and there are a few bundles of spindle cells. The tumor shows itself as a slow-growing neoplasm. There are no retrograde changes. The pigment-bearing cells are located in the neighborhood of the blood-vessels.	
33. Kipp.	36. M.	R. E. Always good health. No history of injury or syphilis. Twelve years ago first noticed a reddish nodule about the size of a pinhead in the lower pupillary margin of the iris. It gave no trouble and no attention was paid to it. The increase in size was very slow, until one month ago. In one month this spot has grown more than it did in the twelve years preceding. During the last few weeks there has been a gradual loss of sight and occasionally pain.	Conjunctiva, sclera, cornea, retina, choroid, lens, and vitreous normal. The A. C. is of normal dimensions but partly filled by a flesh-colored growth, measuring 7 *mm* × 5 *mm* × 4 *mm*. The tumor is nodular. Iris where not attacked appears normal.		Normal.	$\frac{20}{30}$	Lower pupillary margin.	Iridectomy.	"White" spindle-celled sarcoma. Pigment present in small quantities.	In a letter, dated Dec. 10, 1900, Dr. K. writes: "The man lived for five years after the operation, and at the time of his death, due to injuries sustained in a railroad collision, the eye was apparently free from disease."
35. Knapp.	36. M.		No symptoms of irritation. Tumor occupied fully ½ of iris; it was white and slightly vascular.			$\frac{20}{70}$		Iridectomy.	Tumor originated in the stroma of the iris and consisted of white spindle cells.	After operation V = $\frac{20}{30}$. Patient remained under observation for about one year, and the eye was free from irritation.
35. Knapp.	45. F.	The tumor had existed for many years and had grown very slowly.	The tumor was of the size of a small pea.		Increased	$\frac{20}{100}$	Lower part of iris	Iridectomy.	Melanotic spindle-celled sarcoma, growing from the stroma of the iris.	In the three years following the operation there were two mild attacks of iritis.
35. Knapp.	22. M.	L. E. Ten years ago a small speck was noticed in the left eye. No inconvenience until four years ago, when from time to time there was a veil-like obscuration of the vision.	The tumor is yellowish-red in color and projects into the A. C. It is studded with numerous red dots and small lines. It is not quite as large as a small strawberry.	One month later the tumor was removed.	Normal.	Normal.	Outer-lower portion.	Iridectomy.	Sarcoma. "The parts of the iris adjacent to the tumor were to a certain extent infiltrated with nuclei like those in the tumor."	The case was reported three months after iridectomy.
36. Knapp.	53. F.	"Three and a half years ago she had a fibrous tumor removed from the lobule of the left ear. This tumor recurred and was removed one year since. There has been no relapse noticeable so far." Four months before examination impaired vision was noticed and a small tumor developed in the iris and encroached in the pupil. The tumor has increased in size rather rapidly, and the eye at times is painful and congested.	Eye free from irritation. The tumor was the size of a cherry-stone and extended over the adjacent ⅓ of the pupil. Pupil is adherent to the capsule. Lens is cataractous. No pain.		Normal.	P. L.	Out and up.	Enucleation.	The tumor proved to be larger than was anticipated; it was elliptical and 5 x 8 *mm* in size. It could be separated from the surrounding structures except at the ciliary margin, where it was attached to the inner wall of Schlemm's canal.	

Author.	Age. Sex.	History.	Condition when First Seen.	Condition at Time of Operation.	Tension.	Vision.	Primary Position of Tumor.	Operation.	Microscopical Examination of Iris and Globe if Enucleated.	Remarks on Treatment—Later History of Case.
39. Krükow.	25. F.	R. E. For seven years the patient had noticed a black spot on the iris in the place where the tumor developed.	Patient was first examined in 1881, when a slightly prominent spot was present in the iris It was dark brown in color. In July, 1884, there was a hemorrhage into the A. C., which was absorbed in a few days.	In November, 1884, the tumor showed itself as noticeably larger; it filled ¼ A. C., and covered half of the pupil. Vision unchanged.	Normal.	$\frac{12}{30}$	Outer-upper quadrant.	Iridectomy.	Round- and spindle-celled melanosarcoma.	When the case was first reported, a note was made that the patient was seen more than a year after the operation, when no return of the growth was visible. Eleven years after the iridectomy this patient consulted Prof. Ewetzky, complaining of eye symptoms; he removed the eye and histological examination showed the ciliary body to be infiltrated with spindle-celled sarcoma. The choroid was not attacked (*Graefe's Arch.*, xlv, p. 600). In 1900, nearly twenty years after this patient first consulted Prof. Krükow, "he died of general sarcoma—lungs, liver, kidneys, etc." (from a letter from Prof. Krükow to the authors).
40. Lawford and Collins.	21. M.	Family history negative. Spot has been noticed on iris for three years.	The growth involves the entire width of the iris.		+	$\frac{6}{6}$	Lower-inner quadrant.	Enucleation.	Pigmented, round, and spindle-celled sarcoma. Ciliary body involved.	Patient alive and well three and a half years after operation.
42. Lebrun.	36. F.	L. E. For previous three months noticed gradual failure of V in the eye, and during the week before the examination, that the eye was red. Patient has always been fairly well. No trace of syphilis, although she is of strumous diathesis and has a small goitre.	At the inner sclero-corneal border of the iris, in the transverse diameter, is a small, reddish-brown elevation, like a radish seed, and not unlike an iridic condyloma. Slight injection of the scleral vessels towards the inner canthus.	Ten days after admission to the hospital the tumor enlarged to twice its original size, the pupil began to dilate, and the cornea, hitherto clear, showed signs of opacity. In two weeks it presented the appearance of a punctate keratitis, and the new growth had invaded the whole width of the iris. Pericorneal congestion, severe pain in and about the eye.	+		Inner aspect of iris to which at first it was confined.	Large iridectomy including all the tumor. Two weeks later enucleation.	The tumor mass is made up of imperfectly formed connective-tissue, especially towards the point of attachment, infiltrated with numerous round and spindle cells, forming a neoplasm, evidently of recent and rapid growth. Ciliary body and root of iris also involved; the former contains a growth the size of half a pea.	The first operation was followed by sharp reaction, all the symptoms being aggravated, so that in two weeks more the eye was enucleated.
43. Limbourg.	74. F.	Was admitted to clinic on account of partial loss of sight.	Slight episcleral injection. Deposits on posterior surface of cornea. A. C increased in depth. New growth has yellowish color and extends to the cornea. Tortuous vessels at upper margin of tumor. Pupil when enlarged by atropine is obliquely oval. Deeper portion of eye cannot be examined.		+ 1.	Fingers at 1 m.	Upper-inner quadrant.	Enucleation.	Non-pigmented sarcoma formed of spindle cells, between which were a few small round cells. Tumor involved the adjoining portions of the ciliary body. The greater portion of the iris, which seemed normal, was also found to contain numerous areas of tumor growth.	
44. Little.	20. F.	L. E. Sixteen months ago, while in act of stooping, L. E. became suddenly blind and remained so for nearly a week. On recovering sight observed for first time spot on colored part of eye. During these sixteen months there have been three or four attacks of dimness of vision at irregular intervals. Always good health. No suspicion of syphilis. Family history good.	A pale brownish mass, the size of a small pea, on iris, extending from pupillary margin to periphery. It is somewhat irregular in shape, and portions of it are in contact with cornea. Surface presents blood-vessels and numerous red points. Eye free from irritation, fundus normal. "I had no doubt at the time the growth was sarcomatous, but as there appeared to be nothing urgent in the case, I decided to watch it for a time."	Four months after first seen tumor had visibly increased, particularly towards peripheral region; in all other respects eye was same as when first seen.		Normal.	Outer-lower quadrant.	Iridectomy.	Microscopical examination by Dr. Dreschfeld. Mass composed entirely of round cells. Pigmented round-celled sarcoma.	Four weeks after iridectomy, V = $\frac{12}{12}$. Two years after operation there was no evidence of recurrence and the sight was normal. January, 1901, in a personal note to us, Dr. Little says: "In this case there was no recurrence after many years."
45. Marshall.	21. M.	R. E. Both eyes were equally good until three years ago. Since then the right eye has been bloodshot and has failed gradually, but without pain. The day before admission eye became acutely painful and remaining sight has disappeared.	Cornea hazy; A. C. almost obliterated; iris bulged forwards. An iridectomy was performed and then a large, opaque mass, looking like the lens, presented. It was found impossible to remove this. The eye was then excised.	(A white mass occupied the centre of the pupil, simulating opaque, swollen lens matter. While operating for relief of supposed cataract the real nature of the condition became apparent and the eye was excised. This history was given by Lawford, who removed the globe.)	+ 2			Iridectomy, then enucleation.	Small, round, and spindle-celled sarcoma. Unpigmented. The tumor is in contact with the ciliary body and occupies the position of the lens.	

Author.	Age. Sex.	History.	Condition when First Seen.	Condition at Time of Operation.	Tension.	Vision.	Primary Position of Tumor.	Operation.	Microscopical Examination of Iris and Globe if Enucleated.	Remarks on Treatment—Later History of Case.
46 Mayweg.	53. M.	L. E. Sixteen years ago noticed a yellowish-brown spot in the iris, which gave no trouble until about half a year ago. Recently the tumor has changed gradually.	A small, yellowish-brown tumor occupies ¼ of iris. Pupil reacts to light and atropine; there are pigment spots on lens capsule.	Operation two months later		$\frac{20}{20}$	Up and out.	Iridectomy.	Melanotic, spindle-, and round-celled sarcoma.	Under date of May 1, 1901, a private letter to the authors from Dr. Mayweg says that there has been no recurrence of the growth up to that time.
48 Oemisch.	42. F.	R. E. Family history good; health excellent. Five years ago noticed a dark-brown spot on iris of right eye. During three years it grew very little and caused no pain. Two years ago had a sudden loss of vision; but following day vision became normal. During next year had hemorrhages into A. C. One year ago tumor began to grow and eye became nearly blind and painful. Patient had intense headache.	No local injection or other phenomena due to irritation; only a few vessels of conj. were enlarged. In A. C. a dark, gray-blue tumor located behind iris. It occupies nearly a complete quadrant of the iris; it has the size of a small pea. Fundus normal. A few large vessels are seen on tumor. The pupil dilates under atropine; except in the region of iris occupied by tumor, is adherent to ant. caps. The day following the first examination the whole of the tumor was enclosed in a hemorrhagic exudate which came overnight and caused great pain.	The tumor was removed by iridectomy seven days later.	Normal	$\frac{6}{6}$	Lower inferior quadrant.	Iridectomy.	Spindle-celled leucosarcoma.	Four months later, when patient was seen, there was no return.
50. Pansier	38. M.	L. E. About middle of September, 1889, a black spot was noticed on the iris of left eye. Vision was affected, but no pain.	November, 1889, tumor 3 *mm* in diameter and about 5 *mm* high.			$\frac{1}{4}$	Inner aspect of iris.	Attempt at iridectomy. Four days later enucleation.	Pigmented small spindle-celled sarcoma. The iridic tissue about the tumor is filled with cells.	
51. Pflüger.	55. F.	R. E. Patient noticed in iris six years ago a dark spot which has grown gradually. The patient's mother died of a tumor which arose in the naso-orbital region.	Cornea normal. Tumor 3 *mm* wide × 0.5 to 1.0 high, and of dark brown color. The peripheral border reaches the angle of the A. C. Above this tumor is a small second tumor. The iris dilates under mydriatic, showing posterior synechiæ and opacities of the capsule. Fundus normal. V. *u. o.* $\frac{6}{18}$.				Out and down.	Iridectomy	Pigmented spindle-celled sarcoma.	The case was reported a few months after the operation.
36. Pflüger and Horner.	36. F.	L. E. Consulted Prof. Horner because of a small black spot, which had been noticed more than ten years, but which recently has grown greatly.	3. V. 1881. Eye white. Pupil is oval. A three-cornered brown-spot reaches from the edge of the pupil to the angle of the A. C., which includes about ⅓ of the iris.			V = 1.		Iridectomy.	Sarcoma.	In 1884 the eye and the general condition showed nothing of interest.
53. Quaglino and Guiata.	6. M.	A healthy child. Eye trouble three months' duration. Came on slowly without pain or irritation.	A. C. filled in lower ⅔ by a reddish-yellow mass, on upper surface of which are blood-vessels.		+		A larger tumor is below; a smaller one above.	Enucleation.	Pigmented lympho-sarcoma, composed of small cells. Capsule of lens involved.	
55. Robertson and Knapp.	24. F.	R. E. Good health and noticed nothing peculiar till fourteen months ago, when the eye was slightly inflamed. Unattended by pain and only of short duration. Six months later had severe pain in right eyebrow, with dimness of vision. Six months ago found vision very dim, also pupil dilated. During last two months has also suffered from pain in eye.	Right pupil is dilated and reacts sluggishly to light; at its upper and outer ciliary margin there is a light-brown tumor about 1‴ in length and ½‴ in breadth. Tension markedly increased. Refused operation.	Two months later: Left eye normal. Right eye: iris somewhat darker than left. Pupil 3½‴ in diameter. In the iris is an oval brownish tumor, measuring 12‴ × 1‴ and extending downwards. At the ciliary margin there is a chain of three similar tumors of very small size. A plexus of subconj. veins extends from near the margin of cornea towards the periphery. V = P L (?); T + 2. Glaucomatous cupping; otherwise fundus healthy. No tenderness on pressure. Diagnosis from increase in size of tumor and development of new growths; sarcoma.		Fingers close to eye.	Upper-outer part of iris.	Enucleation.	Melanotic sarcoma of the iris, developing from the anterior layer of the iris. Removal of the whole iris might have been sufficient in this case, yet this could not have been determined prior to the enucleation, which operation was so much the more justifiable as the eye had already been blind.	Two years after operation patient was in good health and there was no return of the disease.

Author.	Age. Sex.	History.	Condition when First Seen.	Condition at Time of Operation.	Tension
58. Romiée.	74. F.	R. E. For some time intense pain in eye, radiating over forehead and temple. For forty years has had no vision in the eye and an excrescence at the inner part of the cornea.	An irregular tumor occupies the entire front of the globe, projecting forward more than one *cm.*	Removed eye four days later.	
59. St. John.	50. M.	L. E. Had noticed a black spot upon the iris for about one year. When first seen it was of size of a large pin-head. No pain or other subjective symptom until loss of vision was noticed three months ago.	A large brown mass in A. C., nearly filling that space and pushing iris back.	Enucleation one week after first examination.	Normal
60. Sauer.	7. F.	A red tumor on the iris has existed four months. Since four weeks it is extra-bulbar at the nasal corneo-scleral border.	Nearly fills the A. C.	A tumor, size of a bean, of a grayish-yellow color, extends between the lids. Cornea flat and opaque.	Minus.
61. Schiess.	55. F.	R. E. During seven weeks has been troubled in reading.	A dislocation of the iris has been brought about by a tumor situated in the posterior chamber below. In the sclera near the limbus there are 7 large and small brown, flat spots. To one of the larger of these there goes a thickened ciliary vessel. No inflammatory symptoms.		
62. Schiess.	47. F.	L. E. Has noticed a black spot in the eye for at least 30 years, which has never caused pain.	28, II., 1874. For three weeks smokiness before the eye; fine work is not possible. The tumor increases in size. Pupil relatively wide, drawn towards the tumor. The tumor extends nearly to the cornea and presses the lens backwards. V = 1. 21, III., 1874. Secondary glaucoma, cornea steamy. Ciliary injection. V = $\frac{1}{2}$. Enucleation advised. 11, VI., 1874. V = $\frac{1}{10}$. Ball hard as stone. 29, VIII., 1874. Pupil wider, cornea more opaque, tumor increasing in size.	4, VI., 1879. Since middle of March eye inflamed and painful. V = 0. The tumor has perforated the sclera. 10, VI., 1879. Enucleation.	
63. Schneider.	16. F.	L. E. Eleven years ago the left eye was injured with a fork; five months later the parents noticed a small brown spot near the pupil. This spot did not change until four years ago, when from no apparent cause it assumed a flesh color and began to increase in size.	R. E. normal. L. E. V = fingers 10 ft. No pain, no inflammatory symptoms. A. C. filled with blood. Externally cornea normal, but the lower temp. quadrant of internal layers are hazy. T increased. After 10 days the blood was absorbed, V = $\frac{20}{30}$, and a tumor of the iris was visible, reddish-yellow in color, shaped like a coffee bean. It appeared very vascular; 9 *mm* × 5 *mm.* Pupil reacted to light. Fundus normal. Patient disappeared.	One year later patient returned with dull pain in eye, photophobia. The tumor had grown in all directions. T increased. Cornea hazy. V = less than $\frac{1}{2}$; optic symptoms of pressure atrophy. "A solid, flesh-colored tumor, very vascular."	

Vision.	Primary Position of Tumor.	Operation.	Microscopical Examination of Iris and Globe if Enucleated.	Remarks on Treatment—Later History of Case.
		Enucleation.	Sclera normal. Retina somewhat raised by a sero-sanguineous fluid; optic nerve normal. Crystalline lens intact. Choroid and ciliary body œdematous. Iris is seen only at the extreme lower margin; most of it has been replaced by tumor which fills A. C.; $\frac{2}{3}$ of cornea has been destroyed. The tumor is formed of small round cells and is melanotic.	
$\frac{6}{100}$		Enucleation.	Melanosarcoma involving ciliary body.	
0.	Nasal side of iris.	Enucleation.	Pigmented sarcoma with thin walled vessels.	After sixteen years reported to be in sound health.
$\frac{20}{200}$		Enucleation.	Melanosarcoma.	
	Lower-inner quadrant.		The ball was nearly filled with a melanotic sarcoma.	21, VI., 1879. A melanotic axillary gland (Achseldrüse), size of two cherry seeds, was removed. Six weeks later there was swelling of the liver. June, 1881. The woman is still alive.
	Lower temporal quadrant of iris.	Enucleation.	Found a connective tissue "and epithelial growth apparently from the iris."	The diagnosis is made of "Papilloma originating from the sub-epithelial connective tissue of the iris."

Author.	Age. Sex.	History.	Condition when First Seen.	Condition at Time of Operation.	Tension.	Vision.	Primary Position of Tumor.	Operation.	Microscopical Examination of Iris and Globe if Enucleated.	Remarks on Treatment—Later History of Case.
64. Solomon.	43. F.	R. E. Twenty years ago first noticed a small speck, size of pin-head, at the outer and ciliary margin of right iris. Since then the tumor has gradually increased in size, growing towards the pupillary margin of the iris, which it now slightly overlaps. Lately the patient has suffered from occasional darting pains in the eye.	The tumor is brown in color and non-transparent. External surface of eye is normal. Cornea clear. A. C. shallow. Iris and pupil generally discolored. Lens clear. Vitreous cloudy. "On the anterior surface of the iris as viewed through the cornea there is a small black, elevated mass, about 2 *mm* in width, extending from the pupillary margin apparently to the base of the iris."	Operation three days after admission to hospital.	Normal	$\frac{20}{100}$	Outer ciliary margin.	Enucleation.	The mass involves the whole thickness of the iris, but appears to have grown chiefly in a forward direction; its greatest thickness is at least three times that of the healthy iris. The mass consists of closely packed cells, which in some places are densely pigmented, in others almost entirely unpigmented; in shape spindle and round cells. Mass freely traversed by small blood-vessels. The surface is dotted in many places with secondary deposits of melanotic cells. Ligamentum pectinatum contains proliferating cells. In some sections the cells appear to have entered and passed some distance into the sclera, following the course of Schlemm's canal; they have found their way very freely into the anterior limit of the ciliary muscle, and are infiltrating between the muscular fasciculi. This examination was made by Mr. Priestley Smith.	
67. Tay.	25. M.	L. E. So long as ten years ago there was something so remarkable in the appearance of the eye that it attracted the attention of the house surgeon of the hospital. At the time suffered no inconvenience. No inflammation at any time. Tumor has grown slowly.	Grayish jelly-like mass, with opaque points through it, and abundantly supplied with minute blood-vessels.			Normal until tumor covered pupil.	Lower part left iris	Excision.	The mass consisted of delicate fibrous tissue with cells, some of the latter having several nuclei. Contained pigment.	
68. Thalberg.	64. F.	R. E. Both eyes had been operated on for cataract, and since the operation she complained of constant pain right temporal region.	Right eye irido-cyclitis, deep episcleral injection, ciliary neuralgia, tenderness on pressure. This condition was relieved by ordinary treatment of irido-cyclitis. Patient discharged. Returned in two months suffering as before; condition was again relieved. Returned as before with similar condition several times. Finally, at patient's request, eye was removed because of pain and V = 0.					Enucleation.	The white mass which fills the A. C. under the microscope is a neoplasm made up of cells of varying size and shape. The tumor begins at pupillary margin and reaches Descemet's membrane. The cells develop from the endothelium of the iris. The neoplasm is unpigmented.	
69. Thompson.	51. M.	R. E. Patient came to Moorfields, October, 1898, complaining of bad sight. Gave no history of tumor and did not even know of its existence. The bad sight was due to tobacco, and has improved from $\frac{6}{18}$ in R and $\frac{6}{18}$ in L to $\frac{6}{6}$ in each eye.	Tumor is a cauliflower-like projection of a light brown color, measuring about 3 *mm* × 4 *mm*. It overlaps the pupillary border and causes eversion of the uvea. Dark brown lines run over its surface, but no vessels are visible. There has been no congestion or pain. Pupil reacts normally, except where it is pulled on by tumor. Fundus normal.	Tumor was removed 2½ months after first examination.	Normal.	$\frac{6}{6}$	Lower-outer quadrant.	Iridectomy.	Section shows the structure of a spindle-celled sarcoma, with a good deal of fibrous tissue dividing it into alveoli.	A personal letter from Dr. Thompson, dated March 2, 1901,—a little over two years after operation,—says that he has recently seen the patient and there is no sign of recurrence.
70. Van Duyse and Van Schwensteen.	67. M.	L. E. Patient in good general health. The tumor is of one month's standing; it grew gradually and was accompanied by pain.	A tumor in the A. C. growing from iris and extending to the posterior surface of the cornea. It resembles an oval bean. The tumor is crossed by vessels. The portion of iris not affected by tumor is normal. No pericorneal injection. Vision good until within one month.		+ 1	$\frac{5}{60}$	Inner portion of iris.	Enucleation.	Leucosarcoma of iris.	Three months after operation, no recurrence.

Author.	Age. Sex.	History.	Condition when First Seen.	Condition at Time of Operation.	Tension.	Vision.	Primary Position of Tumor.	Operation.	Microscopical Examination of Iris and Globe if Enucleated.	Remarks on Treatment—Later History of Case.
71. Veasey.	46. M	L. E. Patient's general history good. Examination of a photograph of the patient taken eight years before showed a suspicious-looking shadow on that portion of the iris occupied by the growth. There is a history of two attacks of "neuralgia" during these eight years. For three months before examination the tumor had increased rapidly in size.	Marked circumcorneal injection. Discolored iris contracted pupil, with post. synechiæ and a brownish growth in iris. The tumor was not as long as the width of the iris, and some iris tissue seemed unaffected both at ciliary and pupillary margins, as well as upon sides. No blood-vessels detected, and no hemorrhages.	Potassium iodide was given for one week, at expiration of which time the growth was nearly twice as large as when first seen, and the local conditions were worse.		$\frac{5}{27}$	Upper-inner quadrant.	Iridectomy.	Pigmented round-cell sarcoma.	A letter from Dr. Veasey, dated March 6, 1902, says: "There has not been the least sign of recurrence of the disease."
72. v. Hippel.	49. M.	The tumor was first noticed when patient was ten years old. Thirteen years ago (1867) the eye was examined by Dr. Knapp, who found a tumor half as big as a pin-head. The eye has often been red and hemorrhages have been frequent.	1880. The dark-brown tumor fills the entire under-inner quadrant of A. C. Pupil oval. Tumor is everywhere sharply bordered, only below and out is a projecting process, which looks like a line of blood. Many post. synechiæ. V = $\frac{2}{18}$. 1881, X., 30. The tumor seems not be growing. V = $\frac{2}{18}$.	1889. Ten days ago hemorrhage and pain. Conj. red. Ball prominent. Cornea smooth, but quite yellowish-colored, and in greater part opaque. Ball hard. V = 0.			Under-inner quadrant.	Enucleation.	The entire bulb is taken up with a tumor consisting of polygonal cells with very wide, vascular spaces; the cells are in great part pigmented.	
73. Walker.	59. F.	L. E. Three years ago cataract extracted from left eye without iridectomy. Lately vision has failed in this eye.	There has been no pain nor inflammation. What appeared to be a secondary cataract, slightly pink in color, filled the pupil. Iris seemed rotten and was adherent to capsule. Discission was performed without benefit.	The eye became subacutely inflamed and was excised three weeks later.				Enucleation.	The growth fills the whole eye in front of the fossa patellaris of the vitreous, and is shaped like a large lens. The pigment layer is stretched over its posterior surface and the growth extends to the cornea in front, obliterating the anterior chamber. The structure is that of a spindle-celled sarcoma.	
74. Webster and Van Gieson.	60. F.	L. E. Until four weeks ago patient was not conscious of any trouble with either eye. Then noticed a mist before the left eye. The sight varies, being much worse at times. No family history of cancer.	L. V = $\frac{20}{30}$. Pupil widely dilated except down and out, where there is a tumor of the iris as large as a small pea. The tumor is nearly in contact with the cornea; it seems to extend to the ciliary region. Pulsation of retinal arteries, but no glaucomatous cupping.	Two days later V L = $\frac{20}{30}$.	+ 2.		Down and out.	Enucleation.	A pedunculated, mottled, light- and dark-colored ellipsoidal nodule (4 × 3 × 3 *mm*) attached to posterior surface of the iris by a broad base. On one side the root of the iris and the adjacent portion of the ciliary body are replaced by an extension of the tumor cells. Melanosarcoma of the iris.	
75. Wedl and Bock.		No clinical history. The anatomical description is from an enucleated ball.							The melanosarcoma partly filled the A. C.; it had an irregular build and was bordered on the one side by the posterior surface of the cornea on the other side by anterior capsule of the lens, which is pressed backwards. The ciliary processes on one side are infiltrated with tumor cells.	
76. Werther.	60. F.	R. E. Patient had noticed a brown spot in the iris for a few weeks.	A brown-black tumor in iris, size of a millet-seed. Eye free from inflammatory symptoms. The physician first consulted recommended iridectomy, but Prof. Kamocki advised enucleation.			Good.	Down and in.	Enucleation.	Spindle-celled sarcoma pigmented. Schlemm's canal, ligamentum pectinatum and ciliary body infiltrated with tumor cells.	
76. Werther.	72. F.	R. E. Patient knew nothing about the development of her condition.	A brownish-black tumor, touching the cornea. Pupillary border unaffected. Eye is free of pain and of inflammatory symptoms.			Blind from senile cataract.	Outer-inner quadrant.	Enucleation.	Pigmented spindle-celled sarcoma. Ciliary muscle and processes invaded by tumor cells. Schlemm's canal contains tumor cells.	

Author.	Age. Sex.	History.	Condition when First Seen.	Condition at Time of Operation.	Tension
77. Whiting.	49. M.	L. E. Patient states that the tumor was first noticed when he was ten years old. In 1867, when he was thirty-one years of age, he consulted Dr. Knapp about the growth, which at that time was very small, but which occasionally caused an inflammation of the eye, attended by slight hemorrhages into the anterior chamber.	1882, July. Tumor fills lower-inner quadrant of A. C., covering inferior internal margin of the pupil, which is oblong and does not react to light because of synechiæ. Boundaries of tumor on all sides sharply defined, only on the outermost edge of the lower portion is seen a root-like projection. Diagnosis: melanoma. V O D = $\frac{6}{9}$. V O S $\frac{6}{9}$. 1881, October. Tumor appears not to have increased in size. V O D = $\frac{6}{9}$. V O S $\frac{6}{9}$. 1882, November. Tumor decidedly increased in size, spreading forward over the pupillary margin and to the cornea, which is opaque at this point. Field narrowed. V = $\frac{6}{60}$. Enucleation advised and declined.	1889, September. Seven years have elapsed since last examination. Patient returns because of unendurable pain for preceding ten days. Conj. bulbi markedly congested. Globe probably 2 or 3 *mm* more prominent than other eye. Cornea smooth, but yellow in color; it is not possible to say whether the substance of the cornea is yellow or the discoloration is due to the compact tumor lying close to it. V = 0. T increased.	+
78. Wiegman.	43. F.	R. E. Good family history. In early youth had inflamed eyes. Since birth has had black tumor on iris; the mother saw this a few days after birth. The tumor has remained unchanged in size.	1885, March. Iris light gray; in it is a nearly black tumor 2 *mm* in diam. Otherwise eye is normal. V = $\frac{6}{9}$. Told to let tumor alone and to return for observation.	1891.—Patient returned for first time. Tumor is larger, now presses on the cornea and invades the pupil. Eye free from irritation. Iridectomy done; it was necessary to detach the tumor from the posterior surface of the cornea. Eight months later growth reappeared in scar and this was cauterized.	
79. Williamson.	14. F.	The growth was noticed as a small yellow speck six months before admission to hospital. It apparently began at the periphery of the iris, and as it grew it encroached on the pupillary margin. There had been no inflammation about the eye.	Growth was of a bright yellow color and stood out strikingly against the background of the iris. By strong light and high magnifying power little vascular tufts could be seen on its surface. No sign of the tumor could be made out posteriorly.		
80. Zellweger.	75. F.	R. E. Has noticed for a long time a spot on the under part of the iris. This six or seven weeks before the examination began to grow, and it has become very noticeable. With the growth the vision has decreased and the eye become painful.	In the iris there was a small, pale-red tumor; pupil sluggish and eye not inflamed. Aqueous clear. T normal. Lens cataractous. Tumor about 3 *mm* broad by 2 *mm* high. No signs of iritis or inflammatory reaction. Patient refused operation.	One month later the tumor was larger, and after three weeks the patient returned for operation. The eye was not inflamed.	

THE ABSTRACTS OF THE HISTORIES GIVEN IN THIS DIVISION FURNISHED THE AUTHORS

Reporter.	Age. Sex.	History.	Condition when First Seen.	Condition at Time of Operation.	Tension.
Coe, Anton Washington, D. C.	40. F.	Neuralgic pain at intervals, accompanied by much conjunctival congestion.	The tumor encroached on pupil above. It lay in contact with lens and occupied the posterior chamber.		+

Vision.	Primary Position of Tumor.	Operation.	Microscopical Examination of Iris and Globe if Enucleated.	Remarks on Treatment—Later History of Case.
0.	Lower-inner quadrant.	Enucleation.	Sarcoma involving the choroid.	Six months subsequent to the operation patient reports himself in perfect bodily health and with no irritation of orbital tissues.
[illegible]	Under-outer quadrant.	Iridectomy.	Pigmented spindle-celled sarcoma.	At the time of closing the history, the writer states that in the iris, on both sides of the pillars of the coloboma, there are light brown spots; a drawing shows similar spots in the scar.
Normal.		Enucleation.	The cells are typically spindle-shaped. There are imperfectly developed blood-vessels. The neck of the tumor, composed of spindle cells, extends along a vessel and into the ciliary body.	Iridectomy was attempted, but was impossible because of posterior allusions.
		Iridectomy.	The tumor arose from the posterior layers of the iris.	A note, made one year after the operation, says that nothing new had appeared in the eye, but the condition was changed, in that the woman complained of loss of appetite, and the writer ventures the opinion that a metastasis had taken place to the internal organs.

ARE FROM PRIVATE AND HITHERTO UNPUBLISHED RECORDS FOR THIS PAPER.

Vision.	Primary Position of Tumor.	Operation.	Microscopical Examination of Iris and Globe if Enucleated.	Remarks on Treatment—Later History of Case.
Good.	Upper part of iris.	Enucleation.	Melanosarcoma.	Operation was postponed on account of pregnancy.

Reporter.	Age. Sex.	History.	Condition when First Seen.	Condition at Time of Operation.	Tension
Fick, A., Zurich, Switzerland.	40. F.	30, I., 1900. Patient came on account of a brown spot in the iris, which she says had been there since birth, but it has grown for two years. The spot reached the margin of the pupil one year ago. Examination with the lens shows that it is a tumor, distinctly elevated above the surface of the iris that reaches the margin of the pupil, but not the ciliary border of the iris; considering the latter fact a broad iridectomy was done.		There was before operation incipient cataract of both eyes at the equator. The iridectomy was to such an extent peripheral that not only the edge of the lens but nine ciliary processes could be seen.	Normal.
Nelson, J. R. and Thompson, E. S., New York.	22. F.	L. E. Patient had noticed a nodule on iris for twelve years which has gradually increased in size; in the last three years, growth has been more rapid. Vision has failed gradually. Two years ago enucleation was advised but refused. There have been spontaneous hemorrhages.	1901, Jan'y. Dark pyramidal mass fills lower half of A. C. and extends to upper margin of pupil. Some blood in A. C. Numerous small hemorrhages between cornea and iris, giving growth a "marbled appearance."		Normal.
Post, M. H., St. Louis, Mo.	32. F.	R. E. A tumor of the iris, which was removed by iridectomy, 18th June, 1890.			
*Randolph, R. L., Baltimore, Md.	54. M.	R. E. The general condition good. Patient applied for glasses when condition was discovered.	A small, triangularly-shaped mass invaded the pupillary space on the nasal side; the growth filled posterior chambers on that side. Eye free from congestion.		Normal.
Robertson, C. M., Chicago.	54. M.	L. E. General health good. The growth in iris is of six weeks' standing.	Small elevated spot 2 *mm* in diameter.	Elevation increased to 4 *mm* in two weeks. The tumor pressed against the cornea.	Normal.
†Rogers, W. K., Columbus, O.	46. M.	L. E. General health good; family history negative. Patient complains of slight pain and sense of irritation, which has been constant for about six months.	Slight engorgement of conjunctival vessels overlying the region of the tumor; cornea and media clear; iris reacts to light and accommodation in upper-inner half. Pupil encroached upon in lower-outer segment by tumor, which involves $\frac{1}{4}$ to $\frac{1}{3}$ of the circumference of the iris. Tumor projects into the A. C. about 2 *mm*. Over the tumor tortuous vessels can be distinctly seen. Color slightly darker than neighboring iris.	Immediate enucleation was advised but refused.	
Rogman, Ghent, Belgium.	38 F.	The person is scoliotic, otherwise of good health. No history of tumors in family. The disease has been noticed for nine months.		The tumor is about the size of a little pea. The iris in the region not occupied by it is quite movable. No signs of irritation. Myopia > 20 D. Crystalline lens and vitreous quite transparent.	

Vision.	Primary Position of Tumor.	Operation.	Microscopical Examination of Iris and Globe if Enucleated	Remarks on Treatment—Later History of Case.
Feb. 14, 1900. Cyl + 2. V = $\frac{1}{10}$. April 5, 1900. Cyl = 1.5. V = $\frac{5}{5}$-^{2}. March 13, 1901. — 0.75 — 2. cyl. V = $\frac{5}{5}$.		Iridectomy. I, II., 1900.	Microscopical examination of the part of the iris that was removed was made by Prof. Ribbert. His diagnosis was "melanoma"; his prognosis, because enucleation was not done, was *unfavorable*.	13, III., 1901. The condition of the patient is excellent and no trace of recurrence. "The contention again brought forward, that in cases of sarcoma enucleation must necessarily be performed, I consider fundamentally wrong. The general surgical law that in malignant neoplasms *all tissue involved* must be removed, may be carried out by simple iridectomy if the boundaries of the tumor are clearly visible as they were in my case."
$\frac{20}{30}$	Lower part of iris.	Iridectomy. Two days later, after histological examination, enucleation.	Small spindle-celled, pigmented sarcoma. Ciliary body invaded, but no extension beyond.	
	Lower-outer quadrant.	Iridectomy.	Small spindle-celled sarcoma.	Nov. 19, 1901.—The patient is living and in excellent health. V., with correction, $\frac{20}{20}$.
$\frac{10}{20}$	Nasal side.	Enucleation.	Sarcoma iris.	The patient later saw another oculist, who persuaded her to have eye removed. Two years after enucleation, death from metastases.
Normal.	Upper-outer quadrant.	Iridectomy. Later enucleation.	Melanosarcoma. Ciliary body invaded.	Six weeks after the iridectomy the tumor reappeared and the eye was enucleated. No further return of the growth.
$\frac{5}{200}$	Lower-outer segment of iris.		Dr. Rogers did not get the globe for examination. The recurrent growth was a small, round-celled sarcoma.	One year after the enucleation was first advised, the patient had the eye removed by another surgeon. Within six months after enucleation the patient was seen again and had growth in orbit; this was removed, but followed by recurrence and death in eighteen months.
Not exactly determined.	Lower-inner quadrant of the iris.	Enucleation, 28th June, 1894.	Leucosarcoma with little round cells, at some places fasciculated. In the middle the tumor penetrated into the ciliary body.	Two and one half years later there was no relapse. This case will be elsewhere more fully reported by Dr. Rogman.

* This case is included, for while it forms an exception to the other reports in that there was no histological examination
† This case is included, for although there was no histological examination made of the primary iris-tumor, the diagnosis is assured by the metastatic growths which killed the patient. of the globe, there was such an examination of the recurrent growth in the orbit.

Reporter.	Age. Sex.	History.	Condition when First Seen.	Condition at Time of Operation.	Tension.
Sattler and Krückmann, E.	50. F.	L. E. 16, III., 1888. Iridectomy was done for inflammatory glaucoma. This was followed by improvement of vision to $\frac{5}{18}$. Vision became poorer in 1889, when diagnosis was made of sarcoma of iris and ciliary body. Enucleation was advised, but others spoke against it.		18, III., 1893. The tumor is less in the upper part of the chamber but extends to the posterior surface of the cornea and to the region of the sphincter iridis, sparing the latter. Diagnosis: melanosarcoma.	Not increased.
Sattler, Robert.	49. F.	Large pigment spot since birth in outer and upper quadrant of iris.	There was neither pain, discomfort, nor impairment of sight. Patient came for refraction (hyperopia and presbyopia). At that time there was a distinct, nodular, pigmented neoplasm about the size of a grain of wheat.	Three years after the first and only visit the patient returned with history of great suffering and clinical picture of absolute glaucoma. T + 3. V = 0. Excessive pain.	
*22. Schulch, Wm. and v. Grósz, Emil.	41. M.	28, XI., 1890. Vision has been growing poor for two years; eye blind for one year.	Liver-colored tumor on iris.		+
*22. Schulch, Wm., and v. Grósz, Emil.	39. F.	25, IX., 1885. The tumor has been developing for seven months.	A brown tumor on the iris.		Normal.
Smith, Eugene.	62. M.	R. E. Had been treated for iritis for six weeks.	A black tumor, size of a small split pea, in iris.	Ciliary injection. Tumor growing rapidly	+
Smith, Eugene.	65. M.	R. E. Eye has felt uncomfortable for several weeks.	A small, brownish growth is seen in the iris, of about the size of a split pea. Some pain around the eye.	Slight ciliary injection in the region of the growth. The tumor has been rapidly increasing in size.	Normal.
Smith, Eugene.	58. M.	L. E. Eye has been painful and red for several weeks.	The growth is on the nasal side of iris, and is the size of a large kernel of wheat.	Ciliary injection. Eye is painful.	
The following report was sent to us from the clinic of Prof. Schnabel. We are unable to say to whom we are indebted for it because no name was signed, nor did a card accompany the history.	51. F.	L. E. Three-quarters of a year ago, patient noticed a black spot in the mesial half of the left iris, which grew slowly. Later a similar spot appeared laterally. For several months patient has had photophobia as well as left-sided headache. For that reason she came for treatment to the eye clinic (Hofrath Schnabel).	I., 7, 1901. Iris mesially and below is evenly brown-black, thickened three- or fourfold, and considerably narrowed, so that the pupil is displaced downward and inward. The rest of the iris, which is blue-gray, appears normal, but below and out is one hemp-seed-sized tumor; above are several smaller brown-black nodues. The reaction of pupil to light is absent in the region of tumor; normal elsewhere. The anterior chamber is of normal depth. On the posterior corneal surface and on anterior capsule of the lens are some small clumps of pigment. *Vitreous and fundus* normal. Cornea slightly cloudy, episcleral vessels increased in size and number. There are several pigmented spots in the sclera.		+ 1.

Vision.	Primary Position of Tumor.	Operation.	Microscopical Examination of Iris and Globe if Enucleated.	Remarks on Treatment—Later History of Case.
Amaurosis.	Upper part of the iris.	Enucleation.	The portion of the tumor in the iris was richly pigmented; that in the ciliary body very slightly. It is chiefly a large-celled sarcoma, which extends to the region of the ora serrata, where its termination is sharply defined. Anteriorly, about the ligamentum pectinatum, a few bundles of the ciliary muscle can still be recognized, but none posteriorly. Besides these findings, the eye presents the appearance of a chorio-retinitis of long standing, with complete ablatio retinæ, atrophy of the retina, with hyperplasia of the connective tissue and inflammatory scar tissue in the choroid.	
At time of operation = 0.	Upper-outer quadrant of iris.	Enucleation.	Small spindle-celled sarcoma.	No metastasis. Health of patient remained good.
0.	Below.	Enucleation.		Recurrence in orbit in 1895. Report to authors from Prof. von Grósz.
$\frac{5}{24}$	Above and in	Enucleation.	Spindle-celled sarcoma, slightly pigmented.	Patient died of metastasis.
$\frac{20}{30}$	Lower half of iris and ciliary body.	Attempted iridectomy, but as tumor extended to ciliary body the eye was enucleated.	Melanotic sarcoma of iris and ciliary body. Spindle and round cells.	Six months later the patient died of metastases to lungs and liver.
$\frac{20}{20}$	Lower part of iris.	Iridectomy.	Melanotic spindle-celled sarcoma.	No history of recurrence.
$\frac{20}{40}$	Iris nasal side.	Iridectomy.	Melanotic sarcoma. Mixed cells.	No recurrence.
$\frac{5}{18}$ with + 1.5. V of normal eye = $\frac{5}{18}$ with + 1.5.	Mesial half of iris.	Enucleation. I., 8, 1901.	Melanosarcoma, consisting chiefly of spindle cells. The iris tissue in the region mentioned is completely replaced by it; the well-preserved pigmented area is everted; the ciliary body is normal. The tumor passes into the angle of the chamber only up to the ciliary muscle. The *ligamentum pectinatum is involved by the neoplasm in toto, even in its whole circumference*, while collections of cells—especially in the above-mentioned spots—extend through the sclera and rest of iris in scattered spots. No nævus cells anywhere. Beginning glaucomatous degeneration of the optic nerves, but without excavation. In the anterior capsule of the lens and the posterior surface of the cornea are small accumulations of pigmented round cells.	Primary wound healing. Discharged in a week. Nothing more known.

* This case was observed in the Royal Hungarian Eye Clinic (Budapest) by Prof. Wm. Schulch; the history was sent to us by Prof. v. Grósz.

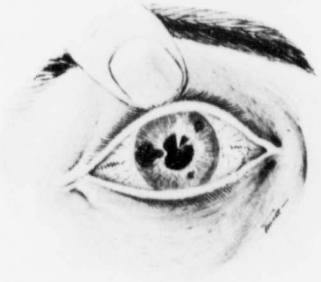

Fig. 1.

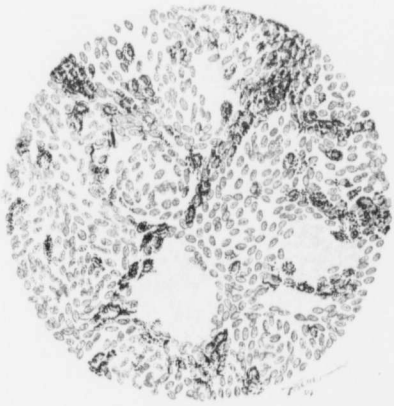

Fig. 2. *Wood.*

Fig. 3.

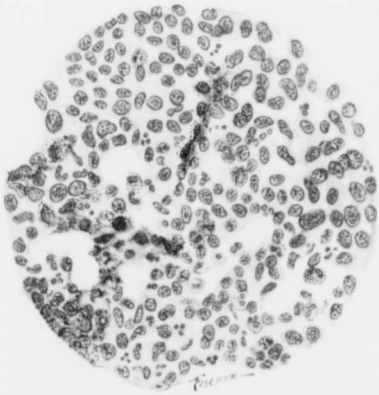

Fig. 4. *Pusey Coleman.*

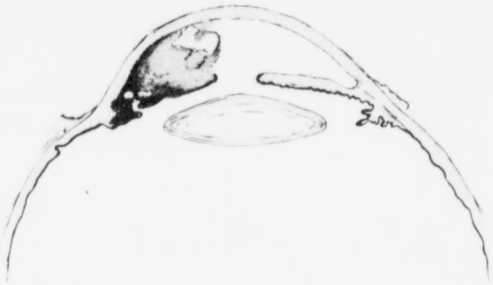

Fig. 5.

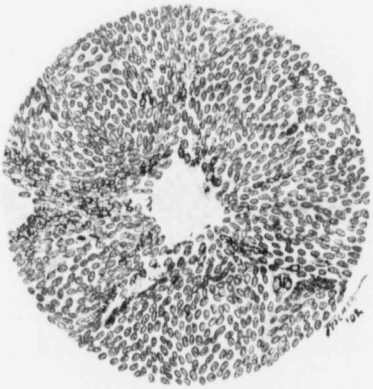

Fig. 6. *Denig.*

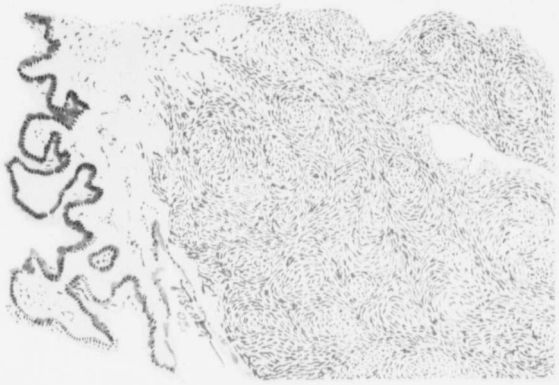

Fig. 7. *Hatz.*

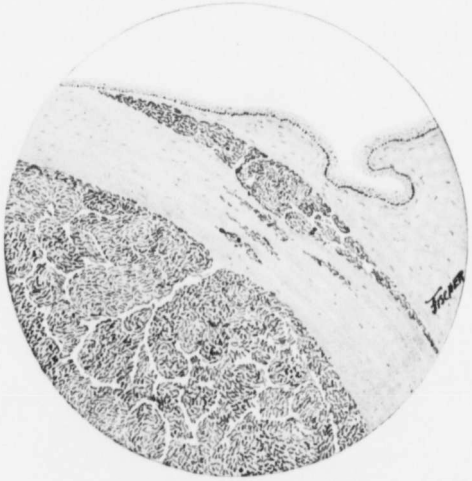

Fig. 8. *Friedenwald.*

第七表

第壹圖

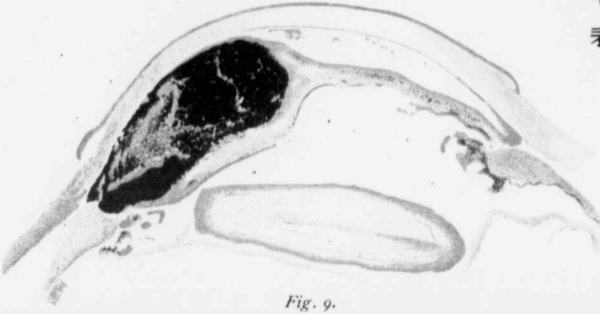

Fig. 9.

第二圖

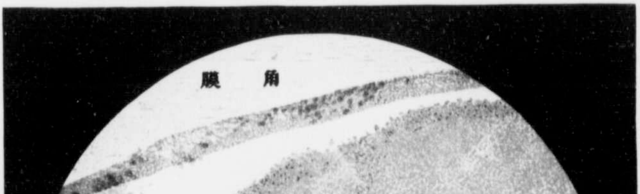

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Fig. 10.

The Knickerbocker Press, New York