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PRIMARY TUMOURS OF THE IRIS*

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PRIMARY tumours of the iris have lately excited much attention and there are a number of interesting studies in the recent literature. Duke and Dunn (1958) carried out a pathological and follow-up examination of 43 iris tumours; Rones and Zimmerman (1958) studied a selected group of 38 melanotic, or potentially pigmented, neoplasms treated by iridectomy only; Cleasby (1958) followed up 21 cases of malignant melanomata of the iris; Reese and Cleasby (1959) analysed a series of 157 cases of malignant melanomata with special regard to treatment and prognosis, and Jensen (1963) reported upon a small series of ten such cases.

A histological and follow-up study of cases of primary tumour of the iris from this Department is now reported, in which the analytical methods of the above workers have been closely followed in order to provide data as nearly comparable as possible. Some of the findings dealing with malignant melanomata were reported at the meeting of the European Ophthalmological Society in Vienna (Ashton and Wybar, 1964).

Material and Methods

The present study is based on the analysis of 145 primary tumours of the iris. Secondary tumours, including those where involvement of the ciliary body prevented a confident diagnosis of a primary origin in the iris, were excluded from the study. All cases were drawn from the records of the Department of Pathology, Institute of Ophthalmology, London, between the years 1945 and 1962. Cases where the slides were no longer available were rejected and the remainder were categorized histologically; follow-up information was obtained from the pathologists and ophthalmologists who had originally sent the specimens to the department.

The cases have been arranged in the following histological groups and will be discussed in this order:

Angiomata	3
Iris freckle	4
Benign melanomata	10
Benign melanomata of pigment epithelium	2
Malignant melanomata	105
Leiomyomatous tumours	21
Total	145

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Angiomata

Angiomata of the iris are extremely rare; Reese (1963) has had only two cases, and Rodin (1929), reporting the first case with a histological confirmation, reviewed nine cases published in the literature at that time and accepted only three as correct diagnoses. Since then only three cases have been reported (Rochat, 1941; Dekking, 1951; Trujillo, 1952).

Three of this series of primary tumours of the iris were angiomata, an incidence of 2 per cent. Two cases were female and one male; in two the growth was in the left eye and in one in the right eye; in two it was situated at the pupil and in one at the middle of the iris. The history of duration varied from a few weeks to "a long time" and there had been a recent rapid or gradual increase in size. Only one patient complained of pain; haemorrhages were seen in all cases. No associated angiomata, either within the eye or elsewhere, were reported.

All three cases were treated by simple iridectomy and histologically the appearances were typical of localized benign angiomata, varying from a capillary type (Fig. 1) to a more cavernous growth with a delicate fibrous stroma into which haemorrhage had occurred. In all cases the growth had been completely excised; there were no recurrences and all are alive to-day having survived 6, 5, and 2 years respectively.

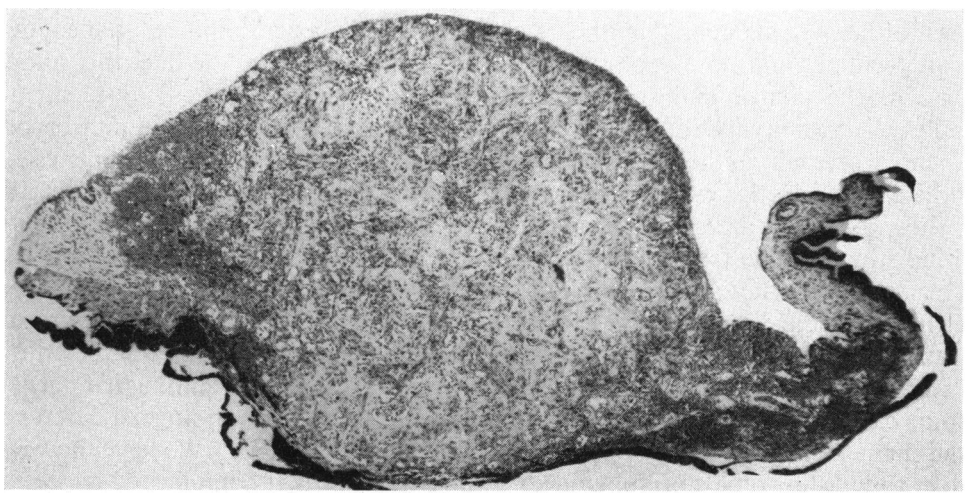

FIG. 1.—Capillary angioma situated in middle of iris. Haemorrhage has occurred into the tissues on either side. Haematoxylin and eosin. ×40.

Melanomata and Leiomyomata

Before dealing with the various subgroups of these neoplasms, it is first necessary to emphasize the difficulties in categorizing them on histological appearances alone. Since they all have a common ancestry in neuro-ectoderm, they share in varying degree similar potentials of morphological differentiation and de-differentiation. Those neoplasms developing from pigment epithelium, from "clump" cells, or from smooth muscle all derive from the pigment layer of neuro-epithelium, while those

developing from stromal melanocytes derive from melanoblasts of the neural crest; both groups thus originate in neuro-ectoderm (Fig. 2).

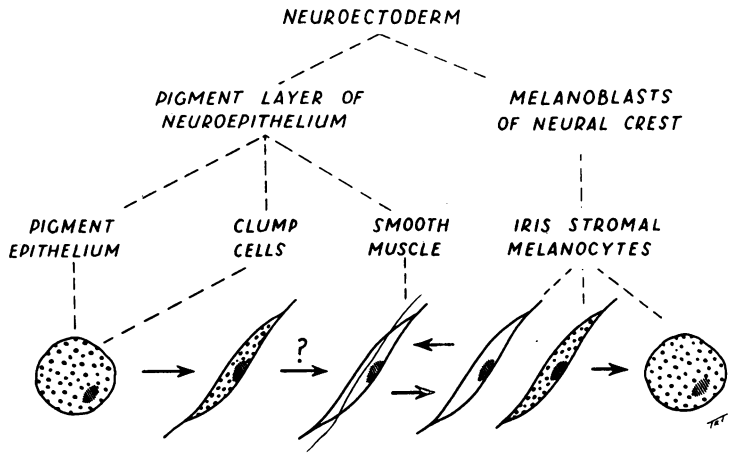

FIG. 2.—Diagram indicating histogenetic and morphological relationships between various cell types of pigmented and leiomyomatous tumours of the iris.

While neoplasms arising from the pigment epithelium or "clump" cells usually consist of heavily pigmented epithelial cells, these may become spindle-shaped, even non-pigmented, and may possibly develop myoglial fibrils. While the smooth muscle of the dilator and sphincter muscles usually gives rise to non-pigmented spindle cells with myoglial fibrils, these may have no myoglial fibrils and may become pigmented or even epithelioid. Although stromal melanocytes usually give rise to spindle-celled growths, either pigmented or non-pigmented, these cells may occasionally show myoglial fibrils and, when engorged with pigment, may become epithelioid and indistinguishable from pigment epithelial cells.

Thus, although these neoplasms can usually be assigned to a particular group on their histological appearances, it is often quite impossible to be certain of their exact origin. Since the fucsin pigment of the epithelial cells differs from the melanin in the stromal cell, it might be hoped that this would assist in determining histogenesis in some cases, especially as electron microscopy has shown morphological differences in the shape of the pigment granules (Tousimis and Fine, 1959). We have, however, not yet found this to be a useful guide, for the issue is further complicated by the fact that pigmentation may be due in some cases to a reactive proliferation or migration of pigmented cells rather than part of the neoplastic process.

It should also be noted here with regard to spindle-cell growths, that other workers have adopted the classification of Callender's A and B types used in describing choroidal melanomata. We have not found this appropriate in the case of the iris, where a large proportion of the melanomata are composed of very small delicate-looking spindle cells which are only rarely seen in malignant melanomata of the choroid. We have, therefore, classified our cases simply into "small" or "large" spindle cells.

Nor have we felt that the term "naevus cells" as used, for instance, in describing junctional naevi of the skin, is applicable in the case of iris neoplasms. It has been

applied to iris tumours showing round cells in clusters as seen in skin naevi, but we have always found that they are in reality small spindle cells cut in cross-section. In any event, the name "naevus cell" should probably be reserved for a strain of cells arising from epidermal melanocytes, and although they have a similar derivation to the iris melanocytes, both having come from the neural crest, they are a separate entity with a distinct behaviour pattern. They have never been conclusively demonstrated in the choroid or iris, nor would they be expected to occur at this site.

Lastly, it should be emphasized that a sharp distinction between benign and malignant melanomata of the iris cannot be made on cytological grounds alone; in the microscopical examination of biopsies from these lesions it is frequently difficult and sometimes impossible to make a confident diagnosis of malignancy or benignity. Although it is easy to recognize such a difference at the extremes of a simple freckle, on the one hand, and of an obviously invasive tumour on the other, the cell types of the intervening lesions are very similar, being usually a benign-looking regular spindle cell without pleomorphism or active mitosis. With these considerations in mind the cases here reported have been classified as clearly as possible, knowing that the criteria adopted are to some extent arbitrary.

Iris Freckles

In four cases the iris lesions were described histologically as a benign naevus or freckle (2·8 per cent.), an incidence which is, of course, entirely artificial as these lesions are only occasionally excised. Three were seen in males and one in a female; their ages were 72, 59, 48, and 22 years. All were treated by iridectomy, one lesion being situated at the pupil, one in the middle sector, and two at the periphery. All were circumscribed and located on the surface of the iris; all had been completely excised.

Histology.—Three consisted of small round cells (sometimes described as "naevus cells"), small spindle cells, and darkly pigmented epithelioid cells. One freckle consisted entirely of heavily pigmented epithelioid cells and the other cases were only moderately pigmented, but in none of the lesions was there conclusive evidence that the pigment epithelium of the iris was involved, as in the type of freckle described by Reese (1963). In all cases the pigmented cell appeared to be a stromal melanocyte although many of them were sufficiently distended with pigment granules to be indistinguishable from epithelial cells.

Follow-up.—Two of these patients have not been traced, but the other two (aged 72 and 59) are alive and well after 6 and 9 years respectively.

Benign Melanomata

This category was reserved for those cases which histologically showed a more extensive and more diffuse proliferation of cells than those diagnosed as freckles, but which nevertheless showed no overt characteristics of malignancy. It must, however, be stressed again that it is not possible to define any sharp boundary between the benign and malignant group, since the cellular types are so similar and mitotic figures are practically never seen; indeed, some of these cases were originally diagnosed as possibly malignant through an ominously dense cellularity or heavy pigmentation.

Ten cases in this series (7 per cent.) were diagnosed as benign melanomata, as compared with 30 per cent. in the series of Duke and Dunn (1958). Two were males and eight were females; their ages ranged from 34 to 84 years. All were treated by iridectomy; only two lesions were situated at the iris periphery, the others being pupillary or in the middle sector. Eight lesions were circumscribed and two were infiltrating; five had been completely removed and in the remaining five this was doubtful.

Follow-up.—This is shown in Table I. Only one of the patients was not traced; of the remaining nine none developed a recurrence and two died of other causes.

TABLE I

FOLLOW-UP OF TEN CASES OF BENIGN MELANOMATA OF IRIS

Follow-up		Number of Cases
Untraced		1
Tumour deaths		0
Died from other causes		2
Died from unknown causes		0 (9)
Living *with* recurrence		0
Living *without* recurrence		7
Survival period without recurrence (yrs)	0–4	3
	5–9	4 (9)
	10–15	2

Benign Melanomata of the Pigment Epithelium

In only two of the series of 145 cases (1·37 per cent.) could we be fairly certain that the tumour arose from the pigment epithelium, as in the cases reviewed by Laval (1952). One had been noted from birth in the periphery of the left iris of a female aged 36 years, and the other had been present for 15 years in the pupillary region of the right iris in a male aged 39 years. Both were treated by iridectomy alone.

No malignant melanomata of the pigment epithelium were encountered in the series.

Follow-up.—Both have been free from recurrence, the first being alive and well after 11 years and the second after 5 years.

Histology.—Both lesions consisted of large heavily pigmented epithelium (Figs 3 and 4, opposite), and one, which was more infiltrating than the other, showed a gradual transition to spindle cells in some areas. Myoglial fibrils were not found in either case. It is clear from the examination of these two groups of benign melanomata that the pigment epithelial cell may become a spindle cell and that, conversely, as previously pointed out, stromal spindle cells when distended with pigment may become epithelioid, so that these cell-types are not necessarily indicative of the origin of the neoplasm.

Malignant Melanomata

Of the 145 primary tumours of the iris, 105 (72·4 per cent.) were diagnosed as malignant melanomata. A comparable figure is that of 65 per cent. in the series of Duke and Dunn (1958).

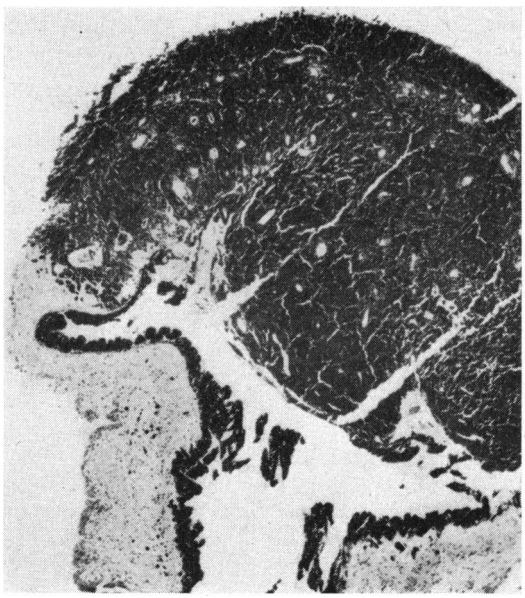

FIG. 3.—Benign melanoma of pigment epithelium. The tumour is heavily pigmented and shows its origin from the pigmented epithelium. While the majority of the cells are epithelial, spindle cells may be seen in some areas. Haematoxylin and eosin. × 27.

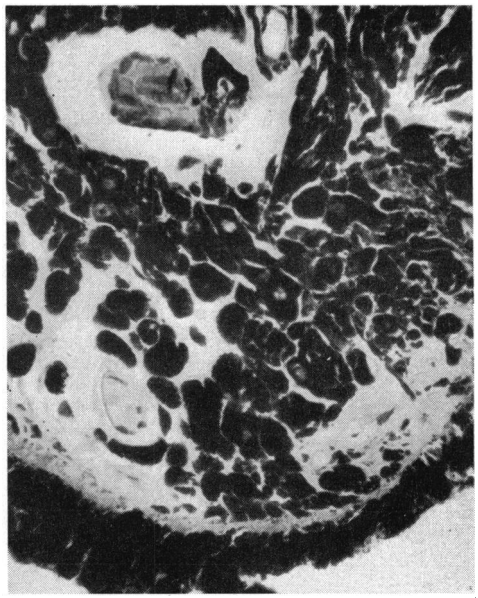

FIG. 4.—High-power view of Fig. 3. Haematoxylin and eosin. × 330.

Age.—Six of the present series were under the age of 15 years, three being under 10 years. Fig. 5 shows that the peak incidence in this series fell between 50 and 70 years of age, but that the average age was 47 years (median age 50). This is somewhat older than the age reported by most other workers; 40 years (Kronenberg, 1938), 42 years (Duke and Dunn, 1958), 40·8 years (Rones and Zimmerman, 1958), 50 years (Cleasby, 1958), 43 years (Jensen, 1963), 46 years (Reese, 1963).

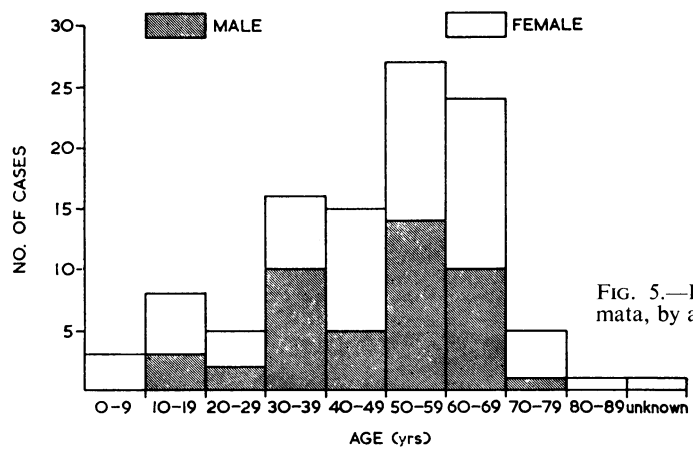

FIG. 5.—Incidence of malignant melanomata, by age and sex.

Duration.—The duration of the lesion, however, must also be taken into consideration. Of the 82 cases in our series in which the duration was known about one-third gave a history of over 10 years, or "since birth", or "as long as the patient

could remember" (Table II). These figures emphasize the well-known fact that malignant melanomata tend to arise in pre-existing benign lesions and to occur at a younger age than malignant melanomata in the choroid, for which the average age at onset is 52·6 years (Kronenberg, 1938), and 55·5 years (Davies, 1962).

TABLE II
DURATION IN 105 CASES OF MALIGNANT MELANOMATA OF IRIS BEFORE OPERATION

Duration (yrs)	Number of Cases	
Recent (less than one year)	28	
1–4	18	
5–9	7	
10–19	4	82
20 and over	5	
Since birth	11	
Many years or "As long as patient remembers"	9	
No information	23	
Total	105	

Sex.—Of the 105 patients in the series, 45 were males (42·8 per cent.) and 60 were females (57·2 per cent.). This higher incidence in females was also noted by Duke and Dunn (1958), but the figures were almost reversed in the series of Rones and Zimmerman (1958). If the figures quoted in this paper are combined with those of the above authors, the sex distribution is almost exactly equal (258 cases; 131 male, 127 female). There is no significant difference between the sex distribution in each age group.

Location.—The right eye was affected in 46 cases, and the left in 53; this information is not available for the remaining six. The majority of the growths were situated at the periphery of the iris; the actual figures are shown in Table IV (opposite). Information regarding the particular quadrant involved was too scanty to warrant analysis.

Surgical Management.—All of the 105 cases were treated surgically as shown in Table III. In 54 of the 62 cases treated by iridectomy or iridocyclectomy alone, no further treatment was carried out because the biopsy had indicated complete removal. In the remaining eight cases, although biopsy showed possible incomplete removal, enucleation was nevertheless not performed.

TABLE III
SURGICAL TREATMENT OF 105 CASES OF MALIGNANT MELANOMATA OF IRIS

Treatment	Number of Cases
Iridectomy alone	44
Iridocyclectomy alone	18
Iridectomy followed by Enucleation	12
Iridectomy followed by Exenteration	1
Iridocyclectomy followed by Enucleation	1
Enucleation alone	29
Total	105

One of these cases (12384/55) is of particular interest; a malignant melanoma developed in an "only eye" and was removed by iridocyclectomy. Histologically removal appeared to have been complete, but the condition recurred 8 months afterwards in the opposite iris leaf; this was removed by iridectomy and was also found to be malignant. Complete removal was doubtful. The patient is alive and well today without recurrence 9 years later.

Enucleation was carried out in 43 cases for the following reasons:

(*a*) Because of a clinical diagnosis of malignant melanoma, or a clinical suspicion of ciliary body involvement (29 cases).

(*b*) Because the biopsy showed incomplete removal (11 cases); in one of these exenteration was performed.

(*c*) Because of local recurrence (2 cases); one (19/59), in which recurrence appeared one year after iridectomy and was treated by iridocyclectomy, which showed incomplete removal, and one (6900/63), in which "ring sarcoma" developed two years after an iridocyclectomy.

(*d*) Because of "blind painful eye" (in one case (25353/59), the eye was removed 5 years after iridocyclectomy).

Histology.—These features are set out in detail in Table IV.

TABLE IV

PATHOLOGICAL FEATURES OF 105 CASES OF MALIGNANT MELANOMATA OF IRIS

Pathological Features		Number of Cases
Location	Pupillary	21
	Middle	18
	Periphery	43
	Sector	11
	Unknown	12
Cell Type	Small spindle	34
	Large spindle	42
	Epithelioid	8
	Mixed	20
	"Naevoid"	1
Myoglial Fibrils	Present	3
	Absent	57
	Doubtful	3
	Unknown	42
Pigment	Heavy	37
	Medium	25
	Light	28
	Irregular	8
	Absent	7
Spread	Circumscribed	28
	Infiltrating	77
Involvement of Ciliary Body	Yes	45
	No	52
	Unknown	8
Tumour Completely Removed	Yes	61
	No	20
	Doubtful	16
	Unknown	8

Cell Type.—It will be seen that the commonest cellular type is the spindle cell; they were either small or large and were almost equally distributed. A fascicular pattern was found in only one case (Fig. 6).

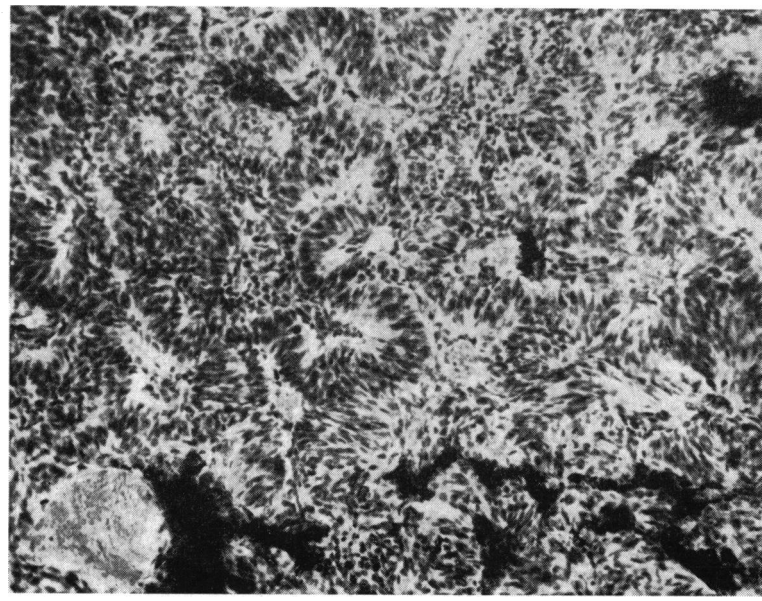

FIG. 6.—Malignant melanoma of the iris, showing fascicular arrangement of the spindle cells. Haematoxylin and eosin. ×170.

Pure epithelioid tumours were rare (only eight in the series), whereas mixed tumours of spindle and epithelioid cells were common (Fig. 7*a*, *b*, *c*, opposite). By the examination of these mixed types it seems probable, as already pointed out, that the epithelioid cell is no more than a spindle cell which has been distended by accumulated intracytoplasmic pigment, for all grades of this process may be seen (Fig. 8*a*, *b*, *c*, overleaf).

One case was classified as "naevoid", since it consisted of small round or fusiform cells arranged in nests, which have been described by others as "naevus cells" (Fig. 9, overleaf), although reasons have been given why this nomenclature is regarded as incorrect.

Pigment.—This was very variable, on occasion patchy and completely absent in only seven cases (Table IV). It appears to have no significance in relation to the invasive properties of the tumour. As described previously it is not always possible to be certain of its source.

Myoglial Fibrils.—Myoglial fibrils were demonstrated in three cases in which the histological features were otherwise typical of malignant melanoma, being of mixed cell type and heavily or irregularly pigmented. In three further cases myoglial fibrils were doubtfully present (Table IV). This emphasizes again the difficulty in categorizing some of the tumours, and suggests, as pointed out by Reese (1963), that leiomyomatous tumours and melanomata may not represent two distinct groups. The matter would be simplified by transferring these six cases to the leiomyomatous group, but this categorization should not be made on the presence (especially upon the doubtful presence) of myoglial fibrils alone.

Follow-up.—The general analysis of the follow-up is shown in Table V (opposite). Of the 105 cases only four were not traced. Five patients have died of causes

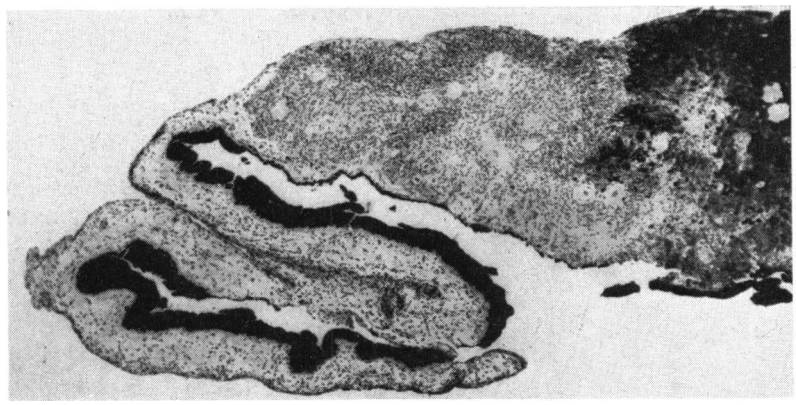

FIG. 7*a*.—Typical malignant melanoma of the iris seen in a folded biopsy specimen. Pigmentation is irregular and the growth consists of spindle cells and epithelioid cells. (*cf.* Figs 7*b* and *c*). Haematoxylin and eosin. ×48.

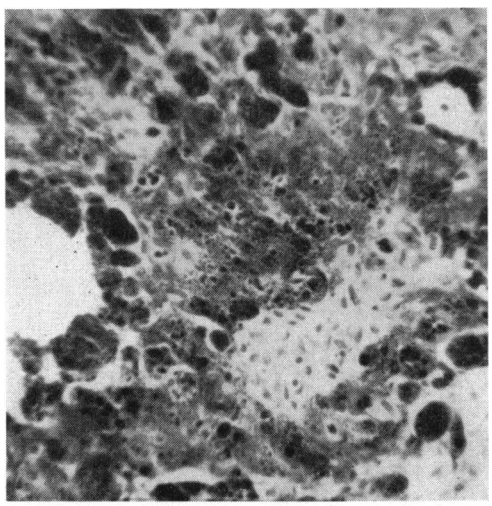

FIG. 7*b*.—High-power view of Fig. 7*a*. The heavily-pigmented area consists of epithelioid cells which appear to be spindle cells distended with pigment. Haematoxylin and eosin. ×300.

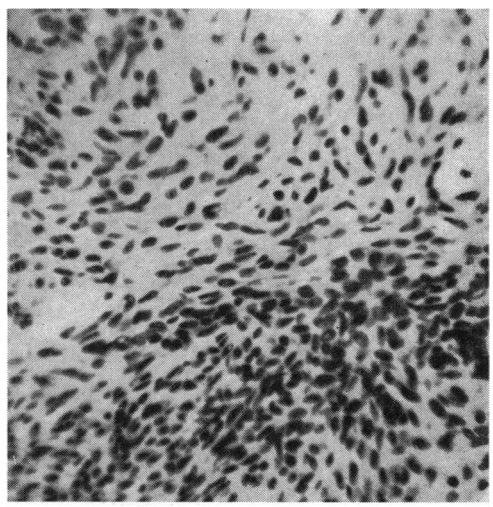

FIG. 7*c*.—High-power view of Fig. 7*a*. The non-pigmented area consists of typical small spindle cells which in cross-section appear as round cells. Haematoxylin and eosin. ×300.

TABLE V

FOLLOW-UP OF 105 CASES OF MALIGNANT MELANOMATA OF IRIS

Follow-up		Number of Cases	
Untraced		4	
Tumour deaths		0	101
Died from other causes		5	
Died from unknown causes		1	
Living *with* recurrence		0	
Living *without* recurrence		95	
Survival period without recurrence (yrs)	0– 4	31	101
	5– 9	36	
	10–14	27	
	15–19	6	
	20–25	1	

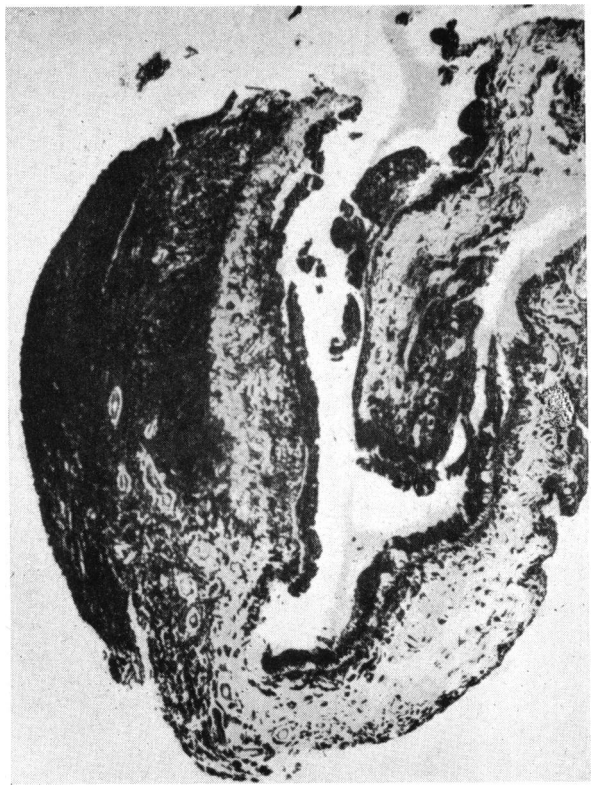

FIG. 8*a*.—Heavily pigmented malignant melanoma of pupillary region of iris. Haematoxylin and eosin. ×70.

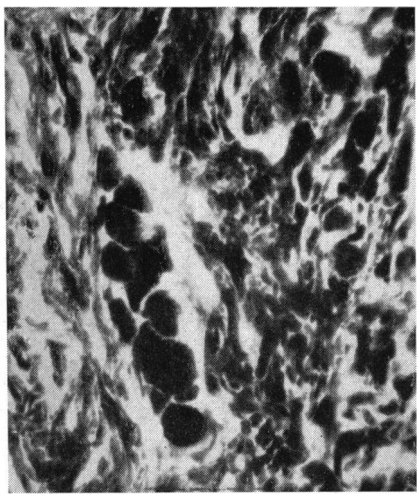

FIG. 8*b*.—High-power view of Fig. 8*a*, showing both epithelioid and pigment cells. Haematoxylin and eosin. ×350.

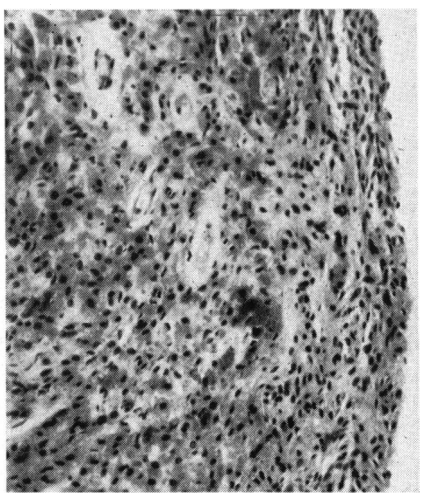

FIG. 8*c*.—Bleached section of tumour shown in Figs 8*a* and *b*. Note that the cell type is uniform and that the different cell appearances are due to varying pigment content. Haematoxylin and eosin. ×140.

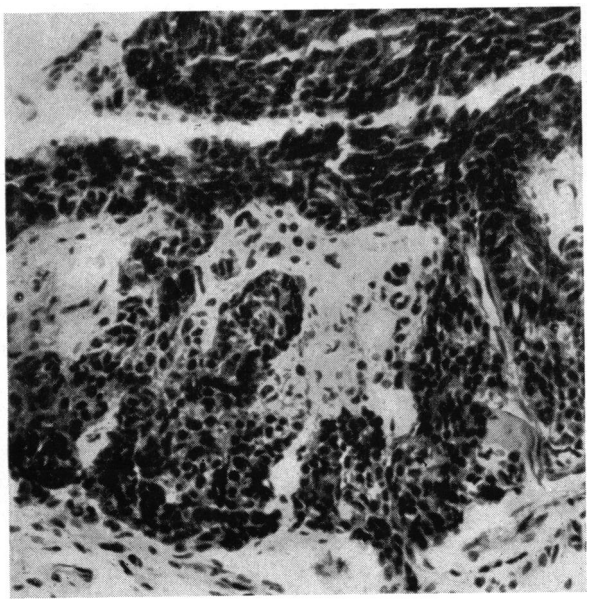

FIG. 9.—"Naevoid" type of malignant melanoma. In cross-section the cells appear round but are actually small spindle cells. They tend to proliferate in clusters. Haematoxylin and eosin. ×280.

unrelated to the iris melanoma and one of an unknown cause, but their periods of survival after operation are included in the analysis. *In the whole series of 101 cases in which follow-up was possible, there have been no known deaths from the iris tumour and there are at present no patients with local recurrence or metastases.*

Of these 101 cases, seventy have survived for over 5 years, 34 for over 10 years, seven for over 15 years, and one for over 20 years (Table V). These survival periods are shown in Table VI in relation to the particular treatment employed.

TABLE VI

ANALYSIS OF 105 CASES OF MALIGNANT MELANOMATA OF IRIS SHOWING LENGTH OF KNOWN SURVIVAL IN RELATION TO INITIAL TREATMENT

Treatment	Survival (yrs)						Total Cases
	0–4	5–9	10–14	15–19	20–25	Not known	
Iridectomy alone	18	11	9	2	1	3	44
Iridocyclectomy alone	8	8	1	0	0	1	18
Iridectomy followed by Enucleation	3	5	2	2	0	0	12
Iridectomy followed by Exenteration	0	1	0	0	0	0	1
Iridocyclectomy followed by Enucleation	1	0	0	0	0	0	1
Enucleation alone	1	11	15	2	0	0	29

All these figures clearly show long periods of survival despite the histological diagnosis of malignancy, and even in cases in which the growth had not been completely removed or had already involved the sclera and filtration angle or had formed a "ring sarcoma", or had even extended outside the globe to form a subconjunctival mass, no orbital recurrences or metastases have occurred after long periods (Table VII).

TABLE VII

MALIGNANT MELANOMATA OF IRIS

Analysis of survival in relation to incomplete removal (8 cases) and extent of invasion seen in the excised eye (27 cases).

Pathology	Survival (yrs)				Total
	0–4	5–9	10–14	15–20	
Histologically not completely removed by iridectomy or iridocyclectomy No further treatment	3	2	2	1	8
Enucleated eyes showing scleral invasion	1	7	10	2	20
"Ring sarcoma"	3	3	6	2	14
Extra-ocular extension	2	1	2	2	7
	3, 3½	9½	11, 12	16, 18	

For instance, of fourteen patients who developed a "ring sarcoma", eight have survived over 10 years after enucleation, and two of these are now well 16 and 18 years after enucleation. Seven cases showing extra-ocular extension have survived 3, 3·5, 9·5, 11, 12, 16, and 18 years respectively (Fig. 10).

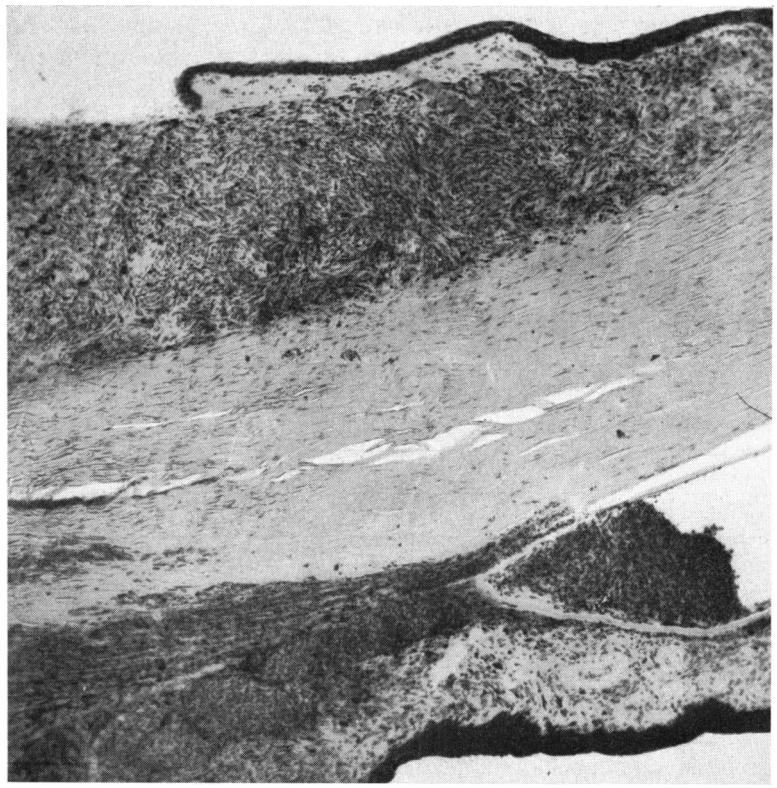

FIG. 10.—Malignant melanoma of the iris, showing "ring growth" invading the angle structures and forming an extra-ocular subconjunctival mass. This patient is alive and well 11 years after enucleation. Haematoxylin and eosin. ×70.

This evidence of the remarkably low degree of malignancy in this group of tumours further supports the findings of other recent workers. It will be interesting to see the outcome of further periods of observation in this series, for there will almost certainly be some tumour deaths eventually. Of cases in the literature followed up for 5 years or longer, the present figure of seventy cases with no tumour death compares with 21 cases with one tumour death (Duke and Dunn, 1958); 67 cases with three tumour deaths (Rones and Zimmerman, 1958); twelve cases with no tumour deaths (Cleasby, 1958); sixty cases with four tumour deaths (Reese and Cleasby, 1959), and ten cases (period of follow-up not stated) with one tumour death (Jensen, 1963).

Leiomyomatous Tumours

The diagnosis of leiomyomata of the iris depends upon:

(1) A typical histology of interlacing elongated spindle cells, with palisading of the nuclei, absent or light pigmentation, and rich vascularity,

(2) The presence of myoglial fibrils (Fig. 11*a*, *b*, opposite).

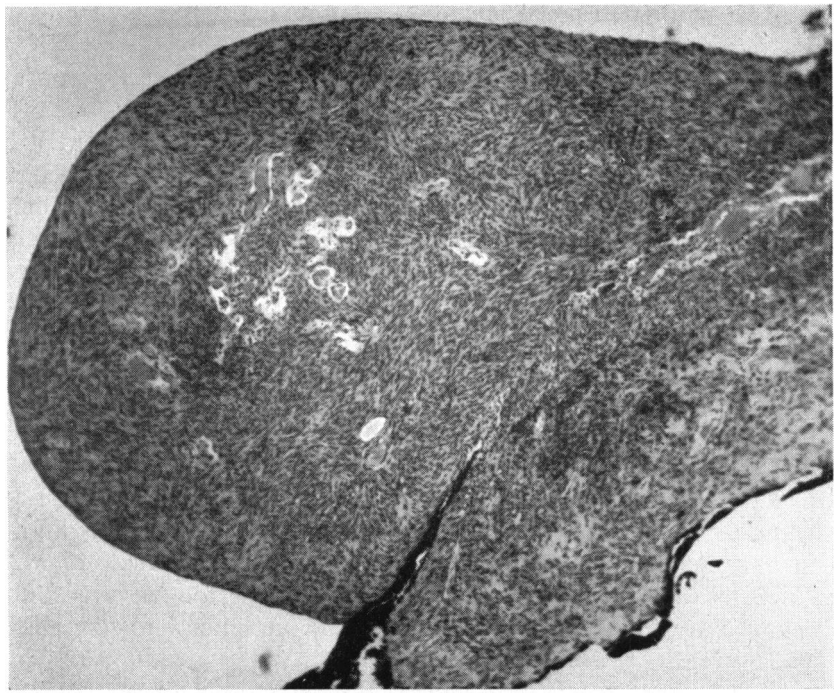

FIG. 11*a*.—Typical leiomyoma of the iris, showing tumour formation, spindle cells, rich vascularity, and non-pigmentation (*cf.* Fig. 11*b*). Haematoxylin and eosin. ×70.

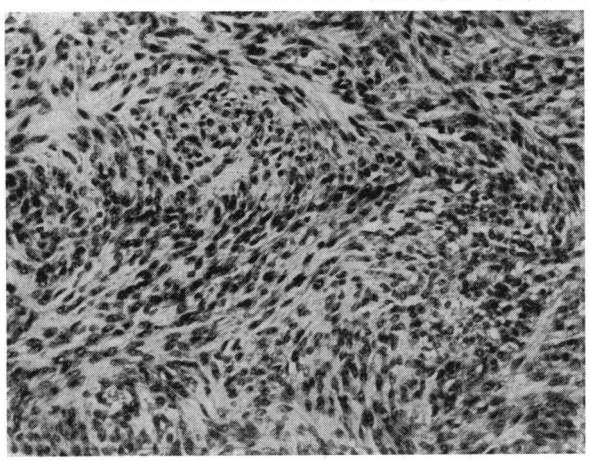

FIG. 11*b*.—High-power view of Fig. 11*a*, showing palisading of spindle cells with whorl formation. Abundant myoglial fibrils were present in this tumour. Phosphotungstic acid haematoxylin. ×128.

When all these criteria are satisfied there is no difficulty in the diagnosis, but cases occur in which the histology is in every way typical of leiomyoma yet myoglial fibrils cannot be demonstrated, and conversely, myoglial fibrils may be found in tumours which in all other respects more closely resemble typical malignant melanomata. While these transitional forms indicate that there is in fact no complete distinction between melanomata and leiomyomata as regards their histogenesis, there are differences in their clinical presentation which make it desirable to separate them for the purposes of a follow-up study. In this section, therefore, are included all those iris tumours showing a histology typical of leiomyoma, irrespective of the demonstration of myoglial fibrils, although these were present in all except four "unknown

cases". Typical malignant melanomata showing myoglial fibrils were discussed in the previous section.

Since the author shares the view of Reese (1963) that no useful purpose is to be served by separating neurogenic tumours from leiomyomatous tumours, as the latter arise from muscle which itself is developmentally neurogenic, no attempt has been made to segregate the type of growth described by Contino (1950) as a neurinoma.

In the series of 145 cases there were 21 leiomyomatous tumours, an incidence of 14·5 per cent., as compared with 4 per cent., in the series of Heath (1951), 2·3 per cent. in that of Duke and Dunn (1958), and 9 per cent. in that of Reese (1963). This present series is the largest to be reported in the literature.

Twelve cases were male and nine female; their ages were scattered evenly between 13 and 77 years (there was no peak between 30 and 50 as found by Reese, 1961).

Characteristically the duration of the lesion before operation was usually long; in four cases it was 14, 22, 28, and 30 years, in six cases it was between 2 and 9 years, and in only three cases was the history under one year. In seven cases the duration was unknown. Four cases presented with hyphaema. The majority of these tumours were infiltrating rather than circumscribed, but the ciliary body was known to be involved in only one case, which was graded as leiomyosarcoma and will be discussed below. No predilection for the pupillary half of the iris was found, there being as many cases involving the middle as the peripheral regions (Table VIII, opposite).

Treatment.—Nineteen cases were treated by iridectomy, which was followed in one case by enucleation, and two cases were treated by enucleation alone.

Histology.—The features of the whole group are set out in Table VIII and it will be seen that they all consisted of large spindle cells in typical arrangement. Myoglial fibrils were found in all cases in which special staining had been carried out (Fig. 12). Pigmentation was usually absent or light. Only one of the five arising at the pupil was pigmented.

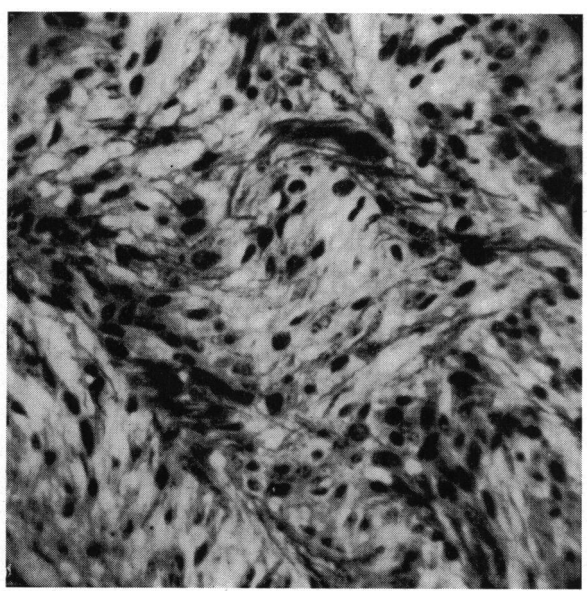

FIG. 12.—Leiomyoma of iris, showing abundant myoglial fibrils. Phosphotungstic acid haematoxylin. ×300.

TABLE VIII

LEIOMYOMATOUS TUMOURS OF IRIS

Pathological Features of 21 Cases

Pathological Features		Number of Cases
Location	Pupillary	5
	Middle	6
	Periphery	5
	Sector	3
	Unknown	2
Cell Type	Large spindle	21
Myoglial Fibrils	Present	17
	Absent	0
	Doubtful	0
	Unknown	4
Pigment	Heavy	0
	Medium	1
	Light	3
	Irregular	1
	Absent	16
Spread	Circumscribed	7
	Infiltrating	14
Involvement of Ciliary Body	Yes	1
	No	18
	Unknown	2
Tumour completely removed	Yes	14
	No	3
	Doubtful	4
Nature	Benign	9
	Doubtful	8
	Malignant	4

Follow-up.—The details are shown in Table IX and it will be seen that there have been no recurrences or deaths from these tumours. One of three cases in which removal was apparently incomplete (Table VIII) is alive and well eleven years after operation.

TABLE IX

FOLLOW-UP OF 21 CASES OF LEIOMYOMATOUS TUMOURS OF IRIS

Follow-up		Number of Cases
Untraced		2
Tumour deaths		0
Died from other causes		0
Died from unknown causes		0 } 19
Living with recurrence		0
Living without recurrence		19
Survival period without recurrence (yrs)	0– 4	0
	5– 9	6 } 19
	10–15	4

Leiomyosarcoma

The distinction between benign and malignant leiomyomatous tumours in the iris is indefinite, and is based more on evidence of invasive properties than on histological features. Eight of the above cases were diagnosed as doubtfully malignant and four as almost certainly malignant; the details and follow-up of these four cases of leiomyosarcoma are shown in Table X.

TABLE X
DETAILS OF FOUR CASES OF LEIOMYOSARCOMA OF THE IRIS

Case Reference Number	Age (yrs)	Duration	Hyphaema	Situation	Myoglial Fibrils	Iridectomy	Enucleation	Completely Removed	Follow-up (yrs)
650/58	77	3 wks	No	Middle	Yes	Yes	No	Doubtful	No recurrence 5 yrs (to 1963)
22319/59	49	14 yrs	No	Sector	Yes	Yes	No	No	No recurrence 5 yrs (to 1964)
23689/59	50	6 mths	No	Pupil	Yes	Yes	No	Yes	No recurrence 3 yrs (to 1962)
27516/59	13	?	Yes	Middle	Yes	Yes	Yes	Ring growth: scleral invasion	No recurrence 3½ yrs (to 1963)

It is interesting that there was no particular age incidence in this group and that hyphaema was not especially indicative of malignancy, since it was present in only one of the cases as against four in the benign group. In two cases removal by iridectomy was apparently incomplete and yet they have both survived without local or distant recurrence for 5 years.

The most definitely malignant case was that of a boy aged 13. Iridectomy showed a typical leiomyomatous tumour massing on the back of the iris, having ruptured through the pigment layer; it extended to the limits of excision. The eye was therefore enucleated and the sections showed tumour cells invading the iris root, the filtration angle, the sclera, and the ciliary body on the side of the iris excision. Growth had spread along the remaining iris surface and invaded the opposite angle (Fig. 13, opposite). It was thus a "ring type" of growth. This patient is well and without recurrence at the present time—3½ years after operation.

Summary and Conclusions

145 primary tumours of the iris examined at the Institute of Ophthalmology, London, between 1945 and 1962 are reported. The group consisted of three angiomata, four iris freckles, ten benign melanomata, two benign melanomata of the pigment epithelium, 105 malignant melanomata, and 21 leiomyomatous tumours. The main features and follow-up details of all these cases are described and analysed.

It is pointed out that, since the melanomata and the leiomyomatous tumours all have a common neuro-ectodermal ancestry, their histological features may overlap to a considerable extent making it difficult to categorize them into clear-cut groups. In the author's view the existence of classical "naevus cells" in the uvea is doubtful,

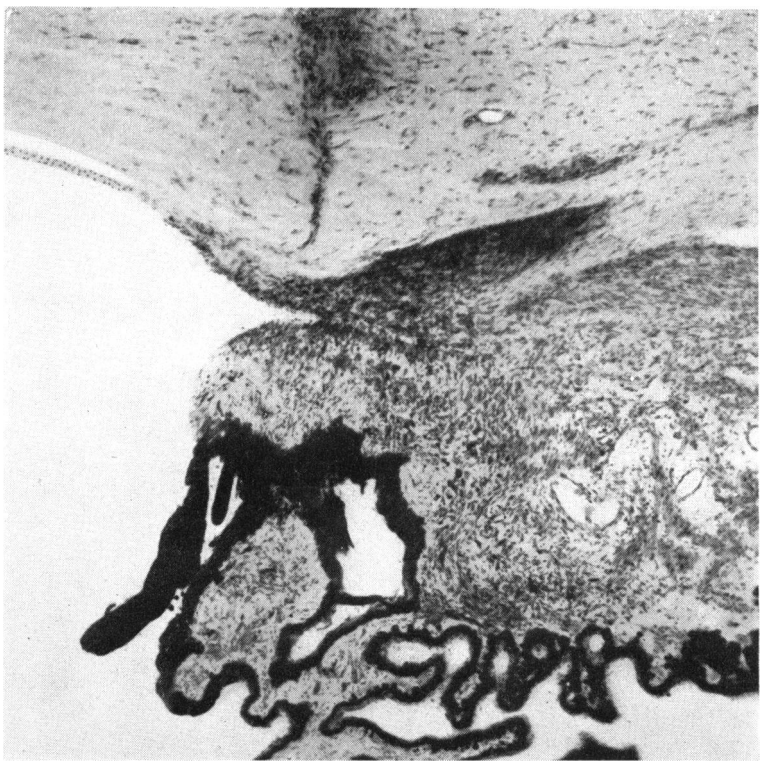

FIG. 13.—Leiomyosarcoma invading ciliary body and angle after incomplete removal by iridectomy. The opposite angle was also involved. The patient is alive and well 3½ years after enucleation. Haematoxylin and eosin. × 70.

and the name should be reserved for neoplasms arising from the epidermal melanocyte. On cytological grounds alone benign and malignant melanomata of the iris cannot be sharply differentiated, and there may be difficulty in distinguishing them from leiomyomatous tumours.

The histological features and follow-up of ten cases of benign melanomata and of two cases of benign melanomata of the pigment epithelium of the iris are described. As expected there have been no tumour deaths in these cases.

The histological features and follow-up of 105 cases of malignant melanomata are described. There have been no tumour deaths in the whole series even after long periods of time, and even in the presence of extra-ocular extension at the time of enucleation. Although it is realized that death from these neoplasms may be delayed for many years, these findings support those of other workers, and it may be concluded that malignant melanomata of the iris are characteristically only locally invasive and metastasis is rare.

Finally 21 leiomyomatous tumours of the iris (four of which were malignant) are reported, forming the largest single series in the literature. There were no tumour deaths in the group and the majority of cases have survived for many years. The behaviour of these tumours also indicates potential local invasiveness, but the prognosis as regards survival is excellent.

It is a pleasure to acknowledge the kind co-operation of the many clinicians concerned in the follow-up inquiry for without their help this survey would clearly have been impossible. I am grateful to Mr. Kenneth Wybar and Dr. O. Satyendran who at various stages have materially assisted in this work. My thanks are especially due to Mr. G. Knight, Miss E. FitzGerald, and Mrs. E. Hond for help with the considerable correspondence and analysis of figures.

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