

stricting effects of the mydriatics used would persist for that length of time, even if the pupillary dilatation continued. We know that the vasoconstrictor effect of adrenalin is from fifteen to twenty minutes at the maximum, and it is improbable that the effects of any of the preparations we use for mydriasis would persist for a much longer time than that.

Dr. Ellett spoke of a case of acute uncompensated glaucoma that developed after the use of a mydriatic. None of my cases developed a lack of compensation, but in the 1,000 cases there were nine of a definitely preglaucomatous type, in which we could prove, by the use of provocative tests, that in the course of time that eye would develop a positive glaucoma. Secondly, I believed that this procedure is of value in preventing the development of a glaucoma of the compensated type in the patient so predisposed. In other words, we can diagnose this type of case much earlier, and, by adequate medicinal therapy, keep it under control.

As to the absolute depth of the anterior chamber in these cases, no record was made before the mydriatic was used.

THE TREATMENT OF SARCOMA OF THE UVEAL TRACT*

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In the treatment of sarcoma of the uveal tract the main issue is: Must an exenteration of the orbit be done at the outset in every case, or, in a desire to avoid further mutilation, may one first enucleate the eye, and let the decision as to a subsequent exenteration rest upon the conditions discovered during the course of the enucleation and the findings of the pathologist? What we wish to do in the general interest of ophthalmic practice is to set forth the elements of

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the problem, and to indicate what, in the present state of our knowledge, the treatment of uveal sarcoma should be.

As the indications for an operation can be assessed only in the light of the conditions it is designed to meet, we shall first consider the alternative procedures in relation to the two main phases of malignant extension. That in sarcoma of the uveal tract general metastases are necessarily frequent is obvious in view of the rich vascularity of the tumor's matrix and the character of its intrinsic vessels. The primitive walls of the vessels especially offer little resistance to invasion, and in a high percentage of the cases neoplastic cells can be seen within their lumina. Indeed, it would seem that contamination of the blood stream is almost invariable, and this conception has led increasingly to a search for other factors to explain the immunity of patients who continue to live after the growth has been eradicated.

Nevertheless, although metastases may occur at any period, a definite relation between the death rate and the stage of the disease appears to exist, and the practice of extirpating the neoplasm at the earliest possible moment will undoubtedly be continued. So far as general metastases are concerned, however, there would seem to be no choice between primary exenteration of the orbit and enucleation of the eyeball, for regardless of whether the neoplastic cells enter the circulation through the vessels of the tumor or the vessels of the eye, the blood of the uveal tract returns in its entirety by way of veins which are severed in one operation just as in the other. The only danger here is that at the moment of excision tumor cells may lodge in unexcised portions of these veins and later give rise to secondary growths within the orbit—a highly improbable occurrence.

The operative indications afforded by a study of the local spread of the neoplasm seem also not to have been clearly understood. The mere fact that local extensions are of frequent occurrence is not sufficient justification for a primary exenteration, as Wätzold and Gyotoku¹ and others appear to

believe. What we need to know is whether the growth has or has not passed beyond the eye, for it is obvious that if extra-ocular extension has not taken place, enucleation is as efficacious as exenteration, and that if extension has occurred, exenteration is distinctly indicated.

This question of extra-ocular extension has been fully investigated, and the following table shows the frequency of its occurrence in several series of eyeballs, including one series of our own from the Royal Victoria Hospital, which have been submitted to pathologic examination after having been removed for uveal sarcoma:

	<i>Number of Cases</i>	<i>Extra-ocular Extension</i>			<i>Number of Extensions</i>
		<i>Anterior Segment</i>	<i>Posterior Segment</i>	<i>Optic Nerve</i>	
Fuchs ²	22	3	2	4	9
Lawford and Collins ³	103	3	18	23	44
Kerschbaumer ⁴	58	6	9	9	24
Marshall ⁵	58	0	6	0	6
Pawel ⁶	100	4	17	2	23
Byers and MacMillan	51	1	4	2	7
Totals	392	17	56	40	113

From the foregoing it will be seen that out of 392 cases only 113, or 28.83 per cent., had extra-ocular extensions. As the figures here given were obtained by reviewing the clinical and pathologic reports of each individual patient, we are justified in inferring that in the average run of cases of sarcoma of the uveal tract extra-ocular extension is the exception and not the rule. Moreover, in view of this conclusion it will seem that in the treatment of sarcoma of the uveal tract primary exenteration as a routine procedure is too radical, and that one may, with provisos, enucleate first and let the decision of a subsequent exenteration rest upon the conditions found during the operation and upon the findings of the pathologist.

The first proviso is that we must perform what is called

a "generous" enucleation. Since these tumors occur most frequently at the posterior pole of the fundus, and since extensions are commonest along the course of the posterior ciliary arteries and nerves and into the optic nerve, it is necessary, for complete histologic study, to leave the tissues covering the posterior pole of the eyeball intact, and to excise the longest possible section of the nerve stalk. This last precaution cannot be too strongly emphasized, for it is certain that residual cells lodged within an unexcised portion of the optic nerve have been responsible for a secondary growth in a larger number of cases than has heretofore been believed. If the full length of the nerve has not been severed at the outset, sound practice demands the isolation and excision of the remainder of the nerve before closing the wound.

The second, and absolute, proviso is that conditions found during the course of the operation and the pathologic findings shall yield us accurate information as to whether or not extra-ocular extension has occurred. In a certain percentage of the cases it is apparent from the outset that perforation of the eyeball has already taken place. This may be inferred from the presence of the usual signs of an orbital growth, or, in the case of the anterior half of the eyeball, we may actually see the nodules on the surface of the sclera. Retrobulbar extensions of small size can be found, of course, only after enucleation has been performed, but macroscopic evidence is not trustworthy; for example, in two of our cases in which a naked-eye inspection was entirely negative, the microscope showed minute but unquestionable extra-ocular extensions. Enucleation must, therefore, rest on the reliability of the histologic examination; and since this is of vital importance, the implications of this matter must be closely observed.

The local extension of uveal sarcoma is influenced markedly by the outer tunic of the eye. Not only does the contiguous sclera form a dense external barrier against invasion of the orbital tissues, but numerous anatomic differentiations within

its structure determine the lines of extension of the neoplasm. What is needed here is not so much confirmation of the clinical diagnosis, with which pathology has generally been satisfied heretofore, as a routine, painstaking examination of the eyeball, including the optic nerve, by one who possesses an intimate knowledge of the histology of the eye, in addition to a sound training in pathology. In making this statement we wish to acknowledge the invaluable assistance to be obtained from one's colleagues in general pathology.

It is probable that the extensions of uveal sarcomas can be recognized with greater readiness than those of any other growth, for the lines of cellular advance can be seen clearly against the background of the sclera. Nevertheless, the histologic findings are sometimes difficult of interpretation. If the aggregations of neoplastic cells are sufficiently large, recognition is easy, but occasional independent elements cannot always be distinguished positively from cellular exudate, particularly when this is of pleomorphic character, and seems to extend from the tumor itself. The presence of histiocytes of the reticulo-endothelial system, and their ready proliferation under the stimulus of irritative changes, frequently leads to the formation of clusters of cells, varying considerably in morphologic appearance, that may simulate neoplastic elements. Pigmentation also may give rise to perplexity. When chromatophores are present adjacent to the tumor base, it may be difficult to determine whether we are dealing with neoplastic elements or merely with pigmented cells that occur normally in the sclera, lamina cribrosa, and optic nerve. Unfortunately, we do not have specific stains for purposes of differentiation. The Dopa reaction, which would be particularly helpful here, cannot be employed because frozen sections of the eyeball are impracticable; neither do depigmented sections give the assistance that one might expect. When, however, the neoplasm has perforated the globe, in our experience it tends so uniformly and so characteristically to spread over the surface of the sclera, probably

under restraint from the epibulbar tissues, as to make diagnosis easy. Granting that the very few doubtful cases are to be classed as extra-ocular extensions, it is our belief that histologic examination can be relied upon to give clear surgical indications.

One important point must, however, be considered in connection with the reliability of the histologic examination, namely, the possibility of extension of the growth by dissemination. May not individual cells, incapable of recognition, break away from the terminus of the cellular chain and extend to the extra-ocular tissues? This process would hardly be possible so far as the substance of the sclera is concerned, but it might conceivably take place along the so-called perivascular and perineural lymph spaces. This occurrence, however, is extremely unlikely, because the fluid within these spaces is negligible, because their continuity is uniformly and largely occupied by obstructive reticula, and because they do not, in any case, anastomose with true lymph vessels within the orbital tissues. So far as the sclera proper is concerned, advance would seem uniformly to be by progressive multiplication of the tumor's peripheral cells.

Local intravenous extension, always a feature of sarcomatous invasion, may occur within the anterior ciliary veins, the *venae vorticosae*, and the veins passing into the optic nerve, but the lines of neoplasia thus formed are apparently easy of detection. Since there are no perforating ciliary veins behind, this mode of extension plays no part in the development of the nodules on the posterior surface of the sclera. In the case of intra-ocular growths at the posterior pole there is, however, a distinct possibility of dissemination taking place into and along the optic nerve following penetration of the lymph spaces which exist around the central vessels, and possibly also within the spreading fibers of the papilla. But here again the dural sheath of the optic nerve forms a strong barrier against extension to the orbital tissues, and as the

optic nerve lends itself easily to histologic examination, the possibility of overlooking neoplastic cells is virtually negligible.

To return to our question regarding dissemination, it seems justifiable to assert that since the chances of a uveal sarcoma spreading in this manner are extremely remote,—except in the case of the optic nerve,—and since neoplastic cells within the optic nerve can be detected with a high degree of certainty,—the reliability of the histologic examination to furnish clear surgical indications is not impaired in these cases by the possibility of dissemination. We may add that in examining the optic nerve care must be taken not to confuse tumor growth with the mesenchymal cell nests which are present within the arachnoid sheath practically throughout life.

Closely associated with the histologic diagnosis is the preparation of the material for microscopic examination. The work that we have outlined requires a fully equipped laboratory and the services of a highly trained technician, and it is perhaps not too strong a statement to assert that without these and the ophthalmic pathologist no service is justified in undertaking the management of an intra-ocular neoplasm.

We are convinced that paraffin sections are essential in this work, and, fortunately, because in the majority of cases of uveal sarcoma the growth is sufficiently small, and because in any case it is only necessary to examine that part of the globe in which the tumor lies in contact with the sclera, it is usually possible to employ this method. Transillumination of the excised eyeball will reveal the tumor mass, and its limits can be marked on the sclera with pen and ink. After fixation in Zenker's fluid, which we recommend not only because it hardens better, but because it permits of the employment of a greater variety of stains, the required part, or parts, of the globe can easily be excised. In the case of large growths, and in flat sarcomas, celloidin sections must be employed, for the

preparation and examination of a complete series of sections of an eyeball by the paraffin method are too difficult to be practicable. At best, however, celloidin sections are too thick for accurate cytologic work, and with this method, at least, the series of sections must be complete, for in following the common practice of examining every tenth slide important elements may be overlooked.

Another great disadvantage of celloidin sections is the time required to prepare them. We have singularly little information in regard to orbital growths secondary to uveal sarcoma, only scanty notes on the cases reported in the literature—no full report of any one case; but we do know that recurrences commonly develop within a few months—in numerous instances within a few weeks—of excision of the primary growth. It is clear, therefore, that the danger limit is closely approached if the celloidin method is employed. The few days required by the paraffin method can make but little difference, but in view of the gravity of the secondary neoplasms, in the case of the large and the flat primary growths which do not lend themselves to rapid investigation, we should feel inclined immediately to exenterate.

Extra-ocular extension affords a clear general indication for exenteration of the orbit. In the case of minute nodules on the surface of the anterior half of the globe the surgeon may be content to excise a generous portion of the overlying bulbar conjunctiva; in instances in which the optic nerve alone has been invaded, there is nothing to be gained by carrying out an exenteration if the maximum length of nerve stalk has been removed. Retrobulbar nodules in association with the perforating ciliary arteries and nerves clearly demand exenteration, for the soft tissues of the orbit offer little resistance to the spread of the neoplasm, and it is impossible in this case to detect isolated neoplastic elements. It is true that at times the orbital tissues seem to possess a certain local immunity against the spread of the tumor, inasmuch as recurrences have been observed after prolonged periods—by

Steiner,⁷ Lukens,⁸ and Pawel,⁶ among others, in twelve and one-half, thirteen, and thirty years respectively. We cannot, however, regard these extra-ocular nodules with the equanimity of von Hippel,⁹ for, as we have noted, they recur with greater frequency within a few weeks or months after excision of the primary growth; and when, as sometimes happens, the neoplasm extends to the accessory sinuses of the nose and to the brain, death occurs after great suffering. We believe that von Hippel's experience of two recurrences in 118 cases has been due to a certain element of chance, but mainly to the quality of his surgery, in observing exactly those precautions we have mentioned.

As an alternative to exenteration of the orbit the surgeon can adopt only an expectant attitude or have recourse to radiation. At this time no one will defend the policy, which has been too generally followed, of waiting until secondary growths have become clinically manifest. A complete follow-up of patients is impossible, and although secondary growths usually develop in or near the wound, the possibility of cryptic invasion of the orbital tissues is too great to be ignored.

In the majority of cases of uveal sarcoma the routine use of radiation following enucleation is as unnecessary as is primary exenteration, if our figures relating to extra-ocular extension are correct. Here, too, reason demands that we shall rest our decision as regards subsequent measures upon the histologic findings, but in the presence of orbital invasion, we should prefer exenteration as the safer procedure in view of the apparently very doubtful effect of radiation upon sarcomas of the cellular types that develop within the uveal tract. Radiation can have no effect on general metastases, except in so far as these may occur in association with orbital recurrences. It remains to be shown that recurrences are less frequent after supplementary radiation than after simple enucleation or exenteration.

In those cases in which exenteration of the orbit is found

to be necessary, the merits of electrocoagulation should not be overlooked. Its advantages are that it permits of thorough removal of the contents of the orbit, especially at the apex; that it controls hemorrhage; and that, by reducing trauma to a minimum and by coagulating the orbital vessels to the limits of the field, it lessens the probability of dissemination. After a single demonstration by one familiar with the technique, no difficulties will be encountered. One or more of the ethmoidal cells may be opened, with slight delay in healing, but in the cases in which we have employed this procedure the orbit has filled in satisfactorily without the use of grafts.

In cases in which the neoplasm has invaded the orbital walls and the accessory sinuses of the nose, one must resort to the extensive operations devised by Golovine¹⁰ and by Filatow,¹¹ but we have had no experience with cases of this kind.

SUMMARY

After considering the alternative procedures in relation to the two main phases of malignant extension, we infer that, in the prevention of general metastases, there is no choice between primary exenteration of the orbit and enucleation of the eyeball. The decisive point in connection with the local spread of the disease is extra-ocular extension, for if this has not taken place, enucleation is as efficacious as exenteration.

As extra-ocular extension was observed in only 28.83 per cent. of the eyeballs removed for uveal sarcoma, primary exenteration of the orbit is too radical as a routine procedure; with provisos one may enucleate first and let the decision of a subsequent exenteration depend upon the findings of the pathologist.

The first proviso is a generous enucleation that will excise the longest possible piece of the nerve stalk and leave the tissues covering the posterior pole of the eyeball intact. The

second, and absolute, proviso is that the histologic findings shall yield accurate information regarding extra-ocular extension.

What is needed is a routine examination of the eyeball and optic nerve by one skilled in the special pathology of the eye. Granted that doubtful cases are to be classified as extra-ocular extensions, the histologic examination can be relied upon to give clear surgical indications. The histologic examination is not invalidated by the possibility of the extension of the growth by dissemination.

A fully equipped laboratory is necessary in the management of cases of intra-ocular neoplasms. Paraffin sections are essential, for celloidin sections are too thick for accurate cytologic work, and the time required for their preparation brings one into the period of recurrences.

Extra-ocular extension affords a clear general indication for exenteration of the orbit. As alternatives, the surgeon may adopt an expectant attitude or have recourse to radiation. The former is unscientific, and the latter is not only of very doubtful value, but in the majority of cases is unnecessary. In cases in which exenteration of the orbit is indicated, we recommend its performance by the method of electrocoagulation.

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DISCUSSION

DR. ADOLPH O. PFINGST, Louisville, Ky.: The essayists have given us something to think about. Until very recently, whenever a case of uveal sarcoma was encountered, no treatment other

than enucleation of the eye was considered. In 1914, in Germany, Krafft found, in a microscopic study of numerous eyes which had been removed on account of intra-ocular sarcoma, that in a considerable number of the cases the neoplastic material had penetrated the sclera along the course of the blood vessels and nerves, and this led him to advocate exenteration of the orbit in all cases in which malignancy of the uveal tract was diagnosed. Other investigators, among them Wartzler, verified Krafft's findings, and showed that even in the early stages of tumor development infiltration along the ciliary blood vessels and nerves, and along the fibers of the optic nerve or its sheath, could be demonstrated, and that in some cases it pervaded the interstices of the fibers of the sclera, thus creating in the extra-ocular structure a nidus for the development of a recidive.

Statistics covering 392 cases would indicate that only about 29 per cent. of the cases of uveal growths lead to local recurrence. Although the great majority of recidives followed enucleation that had been performed after the growth had visibly spread beyond the confines of the eye, they have been observed after enucleation in the first and second stages of the growth. It was this observation and the fact that with our present diagnostic knowledge we are unable to determine clinically whether or not the neoplasm has perforated the sclera, that led some of the German surgeons to advocate exenteration in all cases of sarcoma of the uveal tract.

It seems that the majority of ophthalmologists and pathologists did not accept this view. In fact, in a more recent publication Wartzler reports his ability in many instances to demonstrate microscopically that the sarcomatous tissue, after perforating the sclera, forms small circumscribed encapsulated mural plaques that do not invade the surrounding structures for some time; hence he has departed from his original dictum and now, like most surgeons, advocates enucleation, except in those cases in which visible invasion of the orbital structures makes the operation of exenteration imperative. Wartzler suggested that in all eyes removed for uveal neoplasms, serial sections be made at the point of sarcomatous involvement immediately after enucleation, to determine whether or not invasion of the orbital structures has taken place, thus offering the surgeon the opportunity to exenterate in the event neoplastic spread has occurred outside the eye. Von Hippel has expressed his conviction that even though a few disseminated tumor shreds be left in the orbital tissue, they become encapsulated and that others atrophy, thus offering a certain amount of immunity against local extension of the malignant cells.

We must remember that the invasion of the orbital structure by continuity and the tendency to recidive formation are not the only possible outcomes of sarcoma of the uveal tract, and that the malignant nature of uveal sarcoma manifests itself in a marked tendency of the neoplastic cells to invade the blood and lymph vessels and to lead to a fatal outcome in the development of metastases. It has been observed that the round-cell variety of sarcoma, especially the pigmented type, is more prone to form metastases than the spindle-shaped neoplasms. The time of metastatic development varies, although in most instances it occurs during the first three years after enucleation. Exceptionally it has been observed as late as ten years after operation.

According to the clinical observation of von Hippel and others, metastases may occur while the growth is yet very small, and they occur about as frequently after removal of the eye in the first state of tumor development as in the second or glaucomatous stage, and even after the sclera has been perforated the frequency of metastatic dissemination is but little greater than in the earlier stages. Thus it is apparent that the indication for early enucleation of the eye harboring a sarcoma is most urgent from the standpoint of preventing metastatic dissemination of the tumor cells.

My own impression regarding the safest procedure is that the results after early enucleation have been sufficiently encouraging to warrant a continuance of the more conservative operation unless invasion of the orbital structures is evident. As soon as the diagnosis of sarcoma of the uveal tract is reasonably certain, the eye should be enucleated, and as long a portion of the nerve as possible removed, for, as the essayists say, unless extra-ocular extension has occurred enucleation is as efficacious as exenteration. In my opinion, postoperative radium exposures should be given. The suggestion to study the eye microscopically immediately after removal and let the condition revealed by the microscope be the deciding factor as to choice of operation is worthy of consideration. However, even although lanes of neoplastic cells can be traced through the outer lining of the eye without invading the surrounding structures, enucleation should be given the preference over exenteration.

The operation of exenteration is a very formidable procedure and leaves the patient in a wretched and unhappy state, even after the best obtainable result; hence if left to the decision of the patient, many would reject this operation. Incidentally, it is not an operation that the surgeon would seek.

It is evident that some exceptions must be made from the

general conclusions regarding the treatment of uveal sarcoma. If the eye involved is the patient's only eye, or the only one with vision, surgical interference of any kind would naturally not be justifiable so long as the patient retains some visual function. In these cases properly and carefully applied radiation should be instituted. Such treatment should also be employed in those exceptional cases in which surgical procedure is rejected by the patient.

In those infrequent cases of sarcoma of the iris occurring near the pupillary portion in which the vision is usually not disturbed, neither of the operations under discussion should be considered. In such cases an iridectomy including the growth in the abscised iris seems to be justifiable. A number of such cases have been reported without recurrence. Should the tumor involve the equator of the iris, the ciliary body in all likelihood would also be diseased, and attempts at removal should be discouraged in favor of enucleation.

DR. T. L. TERRY, Boston: Since time limitation precludes detailed discussion of the various features of uveal sarcoma, the authors have confined themselves to a discussion of one single factor, namely, treatment of extra-ocular extensions. However, in view of the title selected, I feel free to suggest several other highly important features of treatment, although they are probably obvious.

(1) If demonstrable evidence of metastasis is already present, then local eye or orbital surgery is warranted only for reasons of comfort or appearance.

(2) If the life expectancy of the patient is, say, three years or less, due to disease other than sarcoma, surgery is again of questionable value.

(3) If the tumor is located in the iris, as Dr. Pfungst has mentioned, and if it even involves the anterior ciliary body, especially when the other eye is blind, it is advisable to consider the removal of the tumor by an iridocyclectomy. An operation of this kind necessitates also an extremely careful examination of the tissue removed, for at times it is impossible to determine by gross examination just how far the tumor has extended. Such an operation was performed by Verhoeff a few years ago, and by me within the last year.

(4) If the cellular classification of uveal sarcoma formulated by Callender is of prognostic value, as it now appears to be, a study of the character of the tumor may prove to be of great importance

in deciding just what operative measures are to be adopted. More recently Lindner, from experience gained from his eyeball-shortening operation, states that it is possible to obtain a biopsy of a choroidal tumor without enucleation. If this proves to be practical, a study of the specimen obtained would aid the surgeon in deciding upon the exact treatment.

In 1934, at a conference at the meeting of the American Academy of Ophthalmology and Oto-Laryngology, I advocated a careful study over the entire extent of the tumor by taking sections at frequent intervals. This had been done on tumors that were somewhat small. If the tumor is small, it is possible and advisable to have many sections, or, better, serial sections, but with a tumor of average size, *i. e.*, from 10 to 12 mm. in diameter, it would be necessary to cut, mount, stain, and study from 500 to 1,000 sections. My more recent studies convince me that extra-ocular extension does not necessarily mean death from cancer. Orbital recurrence was observed once in 94 cases, whereas extra-ocular extension was present in 27 of the cases.

I have modified the table used by the authors by adding the percentages of extra-ocular extensions, and by including the hitherto unpublished findings of Johns and myself. The authors found extra-ocular extensions present at the time of enucleation in only 14 per cent. of their cases, whereas the average is 29 per cent.

	Number of Cases	Extension			Total	Per Cent.
		Sclera		Optic Nerve		
		Ant.	Post.			
Fuchs	22	3	2	4	9	41
Lawford and Collins . .	103	3	18	23	44	44
Kerschbaumer	58	6	9	9	24	41
Marshall	58	..	6	..	6	10
Pawel	100	4	17	2	23	23
Byers and MacMillan .	51	1	4	2	7	14
	392	17	56	40	113	29
Terry and Johns	94	17		10	27	28

Ginsberg believes that orbital recurrences grow very rapidly. However, I am of the opinion that the growth of the tumor remaining in the orbit may be held in check sufficiently by the thickening of Tenon's capsule after enucleation and glass-ball implantation to retard the growth of the tumor for many years, thus explaining the occurrence of liver metastasis even twenty-four years after

enucleation. Now if one should do a generous enucleation posteriorly and any viable tumor cells should remain in the orbit, the theoretical protective value of Tenon's capsule is markedly reduced.

END-RESULTS FROM EXTENSION INTO ORBIT AND INTO OPTIC NERVE FOLLOWED FIVE YEARS OR MORE

	<i>Optic Nerve</i>	<i>Orbit</i>
No metastases.....	2	1*
Metastases.....	3	8

From the following tables we see that size appears to bear no relation to extra-ocular extension. We see further that epithelioid and mixed cell types are more prone to extend through the sclera, whereas the epithelioid type alone is more likely to extend into the optic nerve.

RELATION OF SIZE AND EXTRA-OCULAR EXTENSION FOLLOWED FOR AT LEAST FIVE YEARS

<i>Size (Cubic Millimeters)</i>	<i>Number of Cases</i>	<i>Optic Nerve</i>	<i>Per Cent.</i>	<i>Orbit</i>	<i>Per Cent.</i>
1-50.....	2	1	50
50-250.....	8	1	12
250-500.....	8	1	12	4	50
500-1000.....	26	1	4	3	11
1000-2000.....	32	5	15	4	12
2000-3000.....	9	2	22	3	33
3000-6000.....	7	1	14	1	14
Total.....	92	10		17	

RELATION OF CALLENDER CELL TYPE TO EXTRA-OCULAR EXTENSION

<i>Type</i>	<i>Number of Cases</i>	<i>Optic Nerve</i>	<i>Per Cent.</i>	<i>Orbital Extension</i>	<i>Per Cent.</i>
Spindle A.....	14	1	7	2	14
Spindle B.....	24	3	12	4	16
Fascicular.....	9	1	11	1	11
Epithelioid.....	12	3	25	3	25
Mixed.....	35	2	6	7	20

I introduce these various contradictory remarks not in any desire to weaken the contention of Dr. Byers and Dr. MacMillan, but for the purpose of pointing out that the entire sarcoma problem is filled with contradictions. A correct answer will not be

* This case has been followed seventeen years and the patient is still living and well. Fascicular cell type of tumor.

had until a sufficiently large number of cases have been studied in detail and followed long enough to show us just exactly what does happen in the various cell types of tumors. Until that day is reached I shall continue to believe, as the authors do, that we must use every precaution, including the most detailed microscopic study and exenterations, which we hope are timely.

DR. ARNOLD KNAPP, New York: May I briefly state that in my personal experience recurrence in the orbit has been very unusual in sarcoma of the choroid. I would like to ask Dr. Byers to tell us approximately how many cases of local recurrence after intra-ocular sarcoma are listed in the literature, and secondly, whether the prognosis in cases where a local recurrence has appeared is thereby made much worse.

MR. LESLIE PATON, London, England (by invitation): I am afraid that I can say very little about this subject. Either I have been particularly fortunate, or possibly I have not had enough cases to deal with. I have had one or two such cases in which there has been a subsequent general invasion, but I have had little experience with local recurrence in the orbit. In recent years my habit, after a simple enucleation, is to put in radon seeds or to have the orbit treated with radium, and whether or not this has anything to do with my results I cannot say. My feeling generally is that if, at the actual time of the operation, we have no evidence of extra-ocular extension, and if we treat the case immediately afterward with radium or radon seeds, we will not have a local recurrence.

While the paper was under discussion a question of somewhat acute interest to me at present occurred to me, and that is in regard to the cases which we all have seen that resemble a sarcoma ophthalmoscopically, and when the eye is removed we find that the so-called sarcomatous growth is simply a blood cyst deep in the retina or in the suprachoroidal layer. I have had two or three cases of that kind. In the first two cases the eye was removed. The third case was so similar in its appearance to the other two that I kept the eye in and am still watching the patient, and have been doing so for four years now. Had it not been for those two earlier experiences, however, I should certainly have removed the eye. Can you tell me any method by which one can ophthalmoscopically distinguish that class of case? Just before I left England I had a case of what appears to be a very definite swelling of about five diopters over the macular area. I have left

the man there with his eye intact. I am still in doubt as to what the condition may be, but if you can tell me any method by which one can differentiate that class of case from sarcoma—and remember these are all obviously early cases—I shall be grateful. I am quite sure that many of those present must have removed eyes believing that they were dealing with sarcoma, and after the enucleation found the same condition—a perfectly innocent growth of this character.

DR. W. GORDON M. BYERS, closing: Dr. Knapp's question deals with a difficulty that one encounters in studying this subject. The literature on tumors of the orbit secondary to uveal sarcoma is meager in so far as complete reports are concerned. What information we have is derived mainly from brief notes in the statistical tables of the various authors. Using these as a basis for computation, we have found that orbital recurrences develop in approximately 10 per cent. of the cases.

TUBERCULOSIS OF THE CHOROID ASSOCIATED WITH GENERALIZED MILIARY TUBERCULOSIS

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The allegiance of oculists has been challenged for many years. The question at issue has been which institution has provided the greater source of scientific satisfaction: a foundation, upon which a future superstructure of a complete ophthalmic expression can ultimately be raised; the eye hospital, infirmary, or institute; or the ophthalmic clinic, existing as an integral unit in the various elements that form the regularly standardized or constituted hospital of today.

For the practising ophthalmologist, and much more for the ophthalmic surgeon, much is to be said in favor of the infirmary. It supplies quantities of operative material, without which no surgeon can approach his subject with assurance or develop the delicacy and refinement of surgical technique