Sarcoma of the Eye
and Orbit

Thesis for the Degree of
M. D.

John Orr, M. D.
Case IV

a. Cornea
b. Iris
c. Choroid

d. Corneo-scleral junction

f. Choroid (vascular pigment layer)
g. Retina

h. Tumour

High Power. X 480.
Case V.

p. 67.

a. Cornea.
b. Iris.
c. Ciliary processes.
d. Limbus.
e. Hemorrhage over limbus.
f. Retina (detached).
g. Sclerati.
h. Choroid.
Section through deeper portion of tumour.

a. Cornea.
b. Lens capsule.
c. Chorionic membrane.
d. Intravascular portion of tumour.
e. Extravascular portion of tumour.
f. Silica (split up as it passes forward).
g. Choroid.
h. Retina.
Case VI.

S. 74.

Section through surface of tumor:

a. Serosa.
b. Iris.
c. Biliary process.
d. Sclerotic.
e. Extramedullary portion of tumor.
f. Intramedullary portion of tumor.

f. f. Intramedullary portion of tumor.
g. Otic nerve.
h. Elastic.
i. Elastic.
j. Degeneration area (to outside of this high power shows some myeloid cells).
Sarcoma of the Eye and Orbit.

The study of the diseases of the Eye has always exerted an attraction for me, and I have found the subject of Eye tumours particularly interesting.

Two years before my graduation in 1891 I had frequently attended the clinics of the Ophthalmic Department of the Edinburgh Royal Infirmary, and after my graduation I spent an autumn at the Royal London Ophthalmic Hospital (Moorgate). During the summer of 1893 it was my privilege to act as Mr. George A. Perry's clinical assistant in the Eye Department of the Edinburgh Infirmary, and in this manner I had ample opportunity offered me for seeing much of Eye disease and their treatment. In this period from 1889 up to the present date I have been able to see the clinical characteristics of many forms of Ocular Neoplasia, and of some of these cases I fortunately possess accurate notes.

In this Thesis it is my desire to discuss one form of Ocular tumours, perhaps the least uncommon in the Sarcoma, and at the same time to include in my description a closely allied, if not identical, group of Neoplasms, that is to say, Gloma.

Of these varieties of tumours I possess some specimens,
and I shall describe them in their appropriate place.

The study and recognition of Sarcoma of the Eye and Orbit have for a long time occupied the attention of the Ophthalmic and also of the general Surgeon, and many features of interest have been presented. The disease has been known with many different names, usually bestowed on account of varied eye characters. On this ground perhaps we may account for the apparent discrepancies in nomenclature which have crept into the literature on the subject. In addition to this, in many cases the difficulties in diagnosis have been very great, and indeed, even with our modern methods of investigation of eye disease, there is not infrequently considerable difficulty experienced in arriving at a correct diagnosis.

It will be my aim in this present Thesis to give as concise a description as possible of the disease under consideration, incorporating the cases and references as may be most convenient, and my account will follow the excellent clinical method adopted in the literature on the subject.

Without further preamble then we shall consider the Etiology.

With regard to this some reference must be made, for, although we are unable to offer any.
any sure or certain explanation as to the origin of either corneal sarcoma or ictus any more than we can do so in the case of sarcoma of other parts of the body, we yet have some points presented for our consideration which are of great interest both to ourselves as medical men and to our patients.

Ictus indeed seems to be undoubtedly of congenital origin. This has been disputed, as cases have been brought to the surgeon where it was said the tumour appeared some time after birth. But very often the disease passes unnoticed until some time after birth, and occasionally it is only by the most accidental that the parent notices that their child has an affection of the eye. In some instances there has been observed a whitish reflection from the eye, this has turned out after thorough examination to be of the greatest nature. The majority of cases however are noticed soon after birth, and probably have existed before the actual birth of the child. We may with certainty then say, that ictus occurs in the very young, even in theetus in utero.

Sarcomata tumours proper on the other hand appear practically at any age, and indeed do not in some instances arise till after middle life. They are equally common in both sexes, nor can
we say that Social Surroundings, or Occupation, or employment, have anything to do with the causation, except as far as those circumstances may predispose to the occurrence of any injury to the eye.

This brings me to what I consider a very important factor in Ocular and Orbital Sarcoma, and herein lies one of the most interesting problems connected with this disease. Time and again I have heard patients suffering from Ocular Sarcoma strongly assert that their illness dated from the time they received a definite injury. Possibly this injury may merely have served to direct the sufferer's attention to his eye, and have led him to discover some pre-existing but unsuspected defect. That on the other hand we often find very intelligent and observant people coming before us whose statement is very definite and decided, and not in the least unreasonable. The history which they give is something like this:

The patient had received some time previously a well-defined injury to the eye or to some part in close proximity to the eye. The resulting swelling, due to blood extravasation in all likelihood, failed to subside, or only subsided partially, and then after a time began again to increase in extent, finally attaining such proportions that, when the patient presented himself for
for advice, the signs and appearances in the swelling showed that malignant disease was manifestly present. Of course this sort of history is not uninfrequently met with in other regions of the body, but the connection is not so strikingly manifested as in the case of the particular region at present under our consideration. Now, it is by no means outside the bounds of possibility that the trauma inflicted on such a delicate organ as the eye, has led to some disturbance of the normal process of tissue growth, that the connective tissue cells, say of the ciliary region, having received the shock of the injury, have been perhaps displaced from their natural position and relationships, have received a stimulus to growth in their new locality, and have become actively growing and very cellular. At the same time they have preserved their natural pigmented character, and, being no longer subject to normal growth conditions, have rapidly developed inside the globe. For this hypothetical state of affairs we have an analogue in the peculiar cystic growth occasionally met with in the brain which it is known to occur when an injury has damaged a hair with the epithelium of the hair bulb through the cornea into the anterior chamber. In this case the cells of the included hair bulb grew in their new position and gave rise to a cystic formation there. Be this as it is
may, however, the fact that injury has apparently some
direct action in giving origin to Osseous Sarcoma is
too important to be overlooked.

With regard to what effect Age, Sex, and Social
position exert in the production of Osseous Sarcoma we
cannot say a great deal. Possibly they may have some
influence in predisposing, as far as certain ages, the
male sex, and occupations, involving great liability to
bodily injury, may expose the patient to some of the
factors influencing the development of Sarcoma.

We may say with some degree of certainty that these
Sarcomatous tumours are not infectious; they cannot be
implanted in animals, nor have they been given to
Surgeons operating on Sarcomatous patients, and never has
contact of a living person or animal with Sarcomatous
tissues been the means of transferring the disease to
such person or animal. In short, we can assert that as yet our knowledge of the Pathology of this
disease is extremely uncertain and scanty, and we
dare even now to be as far from the truth as
ever. Though recent researches have made some headway
they have hitherto the present qu ruins in fact that
we can look upon as proved. We still await
reliable information, and this, in the case of a
subject of such a very difficult and complex nature.
nature, can only arise from long continued and careful clinical observation, together with laboratory research work.

Pathology

We shall now enter on the discussion of a few points relative to the Pathology of these sarcomatosous tumours, and this part of the subject is full of interest. I shall have occasion to describe the morbid appearances, naked eye and microscopically, of a few cases which have come under my own observation.

They consist of two chief varieties called Neuro-Sarcoma and Melanotic Sarcoma. Of these two, by far the most usually met with is the latter, the pigmented or melanotic Sarcoma, and owing to the importance attaching to it we shall describe its characteristics in the first instance.

Generally speaking, melanotic Sarcoma arises from those regions of the eye in which pigment is normally deposited, e.g., in the iris, Choroid region, and Choroid coat. Yet, although this is usually the case, we do occasionally find the tumour arising in none at such places as the sclerotic (very rarely), in the Epithelium, lacrymal gland, and Orbit generally. When the tumour arises in the Choroid it seems to have a preference for a particular layer of that membrane, that particular
layer is the vascular layer. Here the disease having started soon proceeds to grow as a bronchial tumor of a somewhat rounded form, and readily bleeds when subjected to any pressure or injury. Some of the areas of the neoplasm are less pigmented than others, and appear as pinkish portions in the midst of surrounding darker tissue. Degeneration areas, whose portions of the tumors have undergone retrograde change, are also seen to present a slatey gray discoloration. Haemorrhages likewise occur in pieces of the tumors and cause the affected portions to be soft and friable and readily broken down. Other smaller eye characteristics features of the growth are detailed further on in the description of the clinical characteristics.

The structure of Inflammatory Sarcoma is found to be of the following nature: it consists of spindle cells arranged in dense networks, the various bundles of cells occupying or running in many different directions, so that in a single section we see under the microscope bundles of cells cut longitudinally and showing their proper spindle shape; while others are cut across giving to the contents of the cell a round appearance, so that we almost seem to have an admixture of the round cell element in the tumor. Between the bundles thin spaces are seen, and these spaces fulfill the purpose
purpose of rudimentary blood vessels. They are often en-
tirely destitute of vascular wall, and therefore we can
readily account for the ease with which these tumours
burst under apparent trivial injury. A delicate epithelial
vascular wall may be present, or the wall may be
simply formed of somewhat condensed sarcoma cells.
The pigment, which endows the tumour with its char-
acteristic appearance, is of golden-yellow, light brown,
or even dark brown or black colour, and is as a
rule found inside the spindle cell as relation to the
cell nucleus. Occasionally the pigment finds lodgment
in the cell protoplasm, and in some cases has even
been observed lying outside the cell altogether, and
in some rarer instances still in the delicate cell
lining the embryonic blood vessels. We have therefore
a great diversity exhibited in the relationship of cell
elements and the pigments of the tumours.

Strangely enough these metastatic neoplasms are
extremely malignant, and possess powers of early and
rapid metastasis. This metastatic tendency occurs
even while the tumour yet occupies the interior of
the globe, and the secondary growths which occur
seek almost without exception the lungs in the first
instance, and thereafter spread to those organs where
the capillary arrangements are well developed e.g. the
Liver, Bones, &. Contrary to the general rule of sarcomatosous tumours, and indeed in direct opposition to what may be regarded as one of the characteristic features of this class of mesoblastic tumours, melanotic sarcoma spreads by the lymphatic channels as well as by the blood vascular system, and for this reason the tumour acquires an additional degree of malignancy.

Passing now to the division of Leuca Sarcoma we find that this group is not so frequently represented in the eye as it is in other parts of the body. When it does occur, however, we find it to have the usual features of non-pigmented sarcoma. It grows from the posterior part of the choroid coat generally, or else from the orbital tissues. In its growth it assumes a more or less globular form, and, as it grows, it infiltrates and pushes aside and condenses the surrounding tissues. Starting, as it does, between the retina and choroid, the former rapidly becomes detached, at first mechanically so that it covers the growing neoplasm, and subsequently by reason of a serous or bloody effusion behind it, which is forced out between the retina and choroid, and the final issue is complete retinal detachment.

Microscopically, Leuca Sarcoma may consist of round cells which have comparatively little protoplasm,
first place, but possess a large nucleus of a round shape. The cells are not arranged in any definite groups, and in the intercellular spaces we find a large number of miniature blood vessels or channels. The blood vessels are in some cases destitute of walls, and in nearly all instances the vessel walls, when present, are very thin. No lymphatic vessels are to be detected.

Again, the tumours may be of the spindle-cell type. In this type, the cells are elongated and attenuated and vary considerably in appearance. Owing to their shape, the cells exhibit a tendency to develop in bundles, these bundles taking different courses in their growth. The result of this is, that in cutting a section of the tumour you cut some of the spindle cells transversely, some longitudinally, and some obliquely, the first looking like the round cells of sarcoma, the two others like spindle cells. In some instances, the cells are slender and thin, and contain little protoplasm, while in others they form a beautiful, uniform arrangement and are very full of protoplasm. As a result of the slight nature of the vascular supply we have manifested in these tumours a great tendency to haemorrhage, and evidence can be obtained by naked eye observation that this has occurred in a given case. For instance, as happened in a case I shall have occasion to refer to wi
detail, there may be plenty of evidence of haemorrhage, which may occur freely on the surface of the tumour, or, being pent up, may result in the formation of a blood cyst containing broken down corpuscles, debris, and altered blood pigment. This feature may in some instances cause the medical man to be at fault in attempting to arrive at an accurate diagnosis, and will tax to the utmost his powers of clinical observation, and sometimes experience alone of some previous similar cases will enable him to grasp the full significance of the various features of the disease with which he is called upon to deal.

These sarcomata are occasionally liable to one of two chief varieties of retrograde change viz. to jelly degeneration and to amyloid degeneration. These degenerative processes are unhappily not very common; but it is useful and comforting to remember that such may occasionally happen in a case, and lead to a more hopeful issue than may at first have been anticipated.

Rarely, calcareous degeneration has been known to occur.

The site of these sarcomata in relation to the various regions of the eye must now concern us for a little, and we find that the parts most commonly affected are the following — the Sclera, Choroid Region, and the Choroid coat. These constitute by far
For the most unusual situations for the development of sarcomatous growth, and when we come to detail the symptoms of Ductus Sarcoma, we shall see the main have to describe the disease as it occurs in these situations.

The other and much less frequently affected parts are the Conjunctiva, lacrimal gland, Serosa, and Eyelids.

That peculiar and closely allied group of tumors the Glionoma (in reality Sarcoma of the hemanglium) develops in the retinal tissues, the connective tissue elements of the membrane thus giving origin to this interesting variety of neoplastic new-growth. Glionoma has its exact site of origin in the granular layer of the retina, and gradually comes to invade all the layers and causes disappearance of the retinal blood vessels.

As the invasion of the choroid, the pigment layer of which is the last to be affected, proceeds forwards to involve the Vitreous body andisis, when the globe is full of the new-growth, the exits from the eye are twisted by a by the Optic nerve, and by the Scleral capsule which however offers a prolonged resistance. Initiation is first noticed in the sclerotic, and once the tissues are softened and partially disintegrated the sarcomatous elements find a soft prepared to permit of their exit, thus in the course of time the Orbit becomes permeated by this malignant growth.
Lastly, we have, constituting a not unfrequent and
distinct clinical class of Sarcoma, in connection with
the eye, Orbital Sarcoma. This may arise primarily
from the periocular connective tissue, or may be the
consequence of the passage outwards of an intraocular
growth into the orbital tissues from the conjunctiva of
the eyeball, the Sarcoma having either burst the globe
or infiltrated in an outward direction through the Sclera.

Such then being the anatomical distribution of Sarcom-
atomic growth in and around the eye, we can now
readily appreciate how varied must be the train of
symptoms presented, and how intricate and difficult
the problems that arise for solution by the diagnostician.

In some cases the neoplasm is fairly readily identified
but in many instances the symptoms are very much
affected by concurrent circumstances. The features are
varied, and for this reason, that the patients do
not present themselves for relief at the same stage
of the disease. This is due to the fact that some
features of the disease are not so marked in some
individuals as in others, at first at any rate; or
the patient is not observant, and, not having any
pain, does not have causes to seek medical advice.
His trouble thus goes on unnoticed, until some inter-
current complication sends him to his medical man,
man, who after thorough examination recognizes the condition, and is able to refer the accidental disease to its real source viz. tumour growth.

These few words at the outset therefore serve to indicate the great value which is afforded to enable us to read aright the Symptomatology of these tumours, and we shall now proceed to show what these symptoms are.

Symptoms.

First let us deal with the Intraocular group of cases. Most of the principal writers on Eye diseases follow Knapp's plan of dividing the course and progress of intraocular growth into 4 Stages, and it seems to me that one cannot do better than follow their example. The method is one which simplifies matters very much and reduces a difficult study into a comparatively easy one. The stages Knapp tabulates are these: 1. Quiescent Stage. 2. Infiltrating Stage. 3. Exenteral Stage. and 4. Metastatic Stage.

This gives a "cut and dry" aspect to the whole matter, and certainly the division is very convenient: it gives a look at once to the diagnosis which is so apt to mislead the inexperienced. One has to see only a few cases, however, to be fairly impressed
that the diagnostician has not always such an easy task before him, for the cases unfortunately require features of great complexity owing to intercurrent modifications and complications, which require much care for their elucidation and accurate interpretation. These difficulties I hope to be able to point out and illustrate by several of some clinical cases.

In order then to give an adequate idea of the symptoms produced by the presence of a sarcomatous tumor in the eye, I shall describe the life-history of such a neoplasm as it might present itself in a typical instance, indicating in my description in what direction the difficulties in diagnosis referred to above are liable to arise.

The first stage, or period of quiescence, lasts for the space of a year or eighteen months, this period being longer or shorter according to the anatomical relation and site of the growth in the eye. The existence of the tumor's growth may remain unsuspected during the whole of this space of time, and its discovery may be quite accidental. Should the disease originate posteriorly from the choroid, then the irritative phenomena will probably be later in reaching their appearance, certain's paroxysms, owing to there being less interference produced here with the nutritive and
and vascular apparatus of the globe. For we find that the important structures concerned with the lymph circulation in the organ are for the most part situated anteriorly, and so it comes about that the structures situated anteriorly are, other things being equal, more freely in making their presence known. A brief reference to the mechanism of the outer lymph circulation will readily make this manifest. Normally the lymph supply of the vitreous humour and lens is carried on in the following manner:—

The posterior surfaces of the iris and ciliary body pour out lymph from their blood vessels; this lymph passes to and nourishes the vitreous humour and lens, and is returned via the iris and ciliary body to the circulatory system of the eye. Dying to the anatomical relations of the iris and lens, fluids can readily pass from the posterior to the anterior aqueous chambers. By this means the lymph reaches the anterior chamber. It then finds its way by the meshwork arrangement of tissues at the iris angle into the outermost space of the vitreous humour.  

1) See Fortner Physiology, Part IV, p. 1165.  
2) ibid., p. 1166
of Fontana, in other words, into the canal of Schlemm, and so into the anterior ciliary veins. Now it is evident that any interference with the free passage of this current will cause a distending back of the fluid in the posterior vitreous chamber, resulting in heightened intracocular tension; and such an interference is readily caused by tumour formation in the neighborhood of the iris and ciliary body. This is in fact a very favourable site for melanotic sarcoma, and consequently we get ample evidence of the above described state of affairs. Whereas should the tumours happen to be situated more posteriorly and not in relation to the iris and ciliary body, we do not expect, nor do we actually have, the same interference with the normal mechanism of intracocular nutrition; and when rise of tension occurs in the more posteriorly situated tumours, its occurrence cannot depend on the same cause. Here, I take it, the phenomenon is to be explained in a different way: it may be due to the neoplasm causing pressure by its growth on the choroidal veins, and thereby inducing increased translucation of fluid into the interior of the eye; or, it may be the result of a kind of inflammatory sarcoma induced by the irritation of the presence of the intracocular tumour.
Another point to be remembered is, with regard to the
increased danger of tumours in cases of intraocular tumours
is, that, the more rapidly growing the tumour is,
the quicker and sooner it is the tumour of the eye raised.
In this the early stage of Ocular Tumour, we
may find, as previously stated, nothing complained of
causing the patient to seek advice, and the growth
goes on increasing till it forces itself on the sufferer's
attention. That on the other hand an observant patient
may himself discover some defect in his vision, a
defect occurring in one eye only, and for the
attenuation of this defect he comes before our notice.
Or again, by some chance such a visual defect may
be brought to the cognizance of a less acute individual.
The visual disturbance complained of may be simply an
Amblyopia or Dimness of Vision of one eye, or may
occur in the form of a well-marked and limited area
of blindness - a Tectoma. This Tectoma on careful
examination is found to be well-delineated and sharply
delimited from the normal portion of the visual field.
It may be regular or irregular in shape, it may
vary in size, and may at one period in the pro-
gress of the case resemble a case of Hemianopsia (vide
Case No. 96, f. 6 by et seq.). Ophthalmoscopic examination,
which follows the discovery, reveals the presence of an
area of detached retina corresponding to the Scleroma complained of. These may be seen a sharply delimited area of swelling of the retina, the color of which area is no longer bright red but is now brownish yellow; and in rare instances, the retina remaining transparent, the vessels supplying the tumor subjacent have been observed running over the surface of the new growth. At this time the appearance may very closely resemble idiopathic retina detachment, and one has to remember in this connection some of the more important features of difference between idiopathic detachment of the retina and detachment due to subjacent tumor formation.

In the latter, for instance, one does not expect to find any associated tumor of the retina, this structure being, in the first instance at least, simply elevated and pushed forward on the surface of the growing neoplasm. Further, the vision of those parts of the visual field not included in the area of Scleroma is much better than would be expected were the cause of weight idiopathic detachment. In the latter disease one will usually find the tension of the eye diminished, while the tension of an eye the seat of Sarcoma or this neoplasm is usually raised, or at any rate not decreased. The exceptions to this last statement are indeed very few, but I shall have reason to
To make mention of a case of Sarcoma in which the ocular tenesmus was, if anything, slightly diminished.

Dilatation of the anterior ciliary veins occurs in cases of intra-ocular Sarcoma because the tumours exert pressure during its growth on the coats of the eye, and obstruct the exit of blood by the venous vortexoral; the blood therefore from the anterior part of the usual tract passes from the eye by the anterior route. A point in diagnosis to be kept in mind is, therefore, that of anterior ciliary venous dilatation on the affected side.

In a typical example of this, the Quiescent Stage of the tumour, the tumour may be readily recognised by the united eye, with or without the assistance of focal illumination, and one of the cases narrated below is an instance of this (case 70, p. 60). The occurrence of an easy diagnosis is noted when the Sarcoma is in relation to the iris or ciliary body from either of which it may have sprung, it can then be recognised as a small, usually dark-coloured body, bulging the iris forward or detaching the peripheral connection of the iris at one side, and enlarging the area previously occupied by that portion of iris. It may at first sight simulate Iris-Melanosarcoma, but is distinguished by the fact that the iris does not assume such an eccentric position as in Iris-Melanosarcoma, nor does one get
get in the area of apparent peripheral iris detachment, a red fundal reflex on ophthalmoscope examination, as would be obtained were the iris simply loose from its peripheral connections. Careful and thorough examination thus with the means at our disposal suffice to make the case clear.

Stage of Irritation

But sooner or later we find that irritation and interference with the sensor nutritive vascular apparatus are set up, and then we are brought to the stage where difficulty and often error in diagnosis are apt to occur. This is due to the peculiar effects brought about by the progressive growth of the tumour, and in the majority of cases perhaps the patient only seeks advice when his malady has reached this stage, the earlier and less ominous symptoms of the first stage having passed unnoticed or unheeded. What do we find now? Firstly, we find that there is a very prominent symptom. It is diffuse in character, dull and aching, and limited to the eyeball, or is of a more sharp, cutting, and lancinating nature, spreading itself over the forehead and scalp and cheek, and of a somewhat neuralgic type. The pain is the cause of much worry and loss of sleep and may gradually bring about exhaustion of the patient.
Often it is more marked at night, and seems to undergo exacerbations from time to time without any definite or appreciable reason. The cause of this pain is readily intelligible when we consider that a solid respiration is growing and increasing in bulk more or less rapidly inside such a closed and inelastic chamber as the globe of the eye, whose interior moreover is already occupied normally with several important structures, its capacity being thus necessarily limited and permitting of only slight variation in dimensions and adaptability. The sufferer, once set going, is continued during the whole of his the second or imitative phase of the disease. This stage, as one would naturally expect, is not to last as the preceding, and yet a degree of relief is experienced, for a time at any rate, when the malady proves to its third stage by ceasing to confine itself to the interior of the globe, and finding its way to the outside.

Still, notwithstanding its importance as a symptom, there is not of great service to us in making a diagnosis of irritable uveitis. It certainly has its importance in bringing the patient to us in the first instance, when we may be able to ascertain the existence of this, and, for our purposes, more useful and interesting phenomena. For we often find that the iridnecr
vision of the eyeball is raised, and that perhaps to a considerable degree. We can also ascertain the existence of amblyopia or even asthenopia, if not previously discovered, and we may be able by ophthalmoscopic examination to demonstrate the corresponding changes in the appearance of the fundus. The nature of these changes has already been referred to.

But now come our difficulties. Associated with pain we do not uncommonly find inflammatory Glaucoma present, which by rendering the vessels media muddy and somewhat intraparent and cloudy, greatly militates against our being able to obtain an accurate and satisfactory view of the fundus. On questioning the patient, however, we ascertain that the pain has remained steady and constant from its first appearance, so that no relaxation of its rigours has occurred, nay, it has rather increased and become less bearable; the malady in short has been progressive in nature. In addition, in the majority of cases one eye only is affected, although these are recorded several instances, rare ones, happily, where both eyes have been simultaneously affected. This, however, is so uncommon as to be simply remembered, but surely reckoned as a feature in any way minimizing the importance of the unilateral Glaucoma as a symptom. True and primary Glaucoma we find,
Moreover, is preceded by a long category of "protrusional"
phenomena, all of which are of a distinctive and time-
what characteristic nature. They are of course absent in
this class of secondary Glaucoma under our consideration.
In this way a carefully conducted inquiry will greatly
facilitate our coming to an accurate diagnosis of the disease
than its complicating associations tend to mask its true
nature. As to the nature of this secondary Glaucoma I
need add nothing to what has already been mentioned
above concerning its connection with the tension and
vascular nutritive mechanism of the globe.

This however does not complete the host of difficulties
which beset the diagnostician in this second stage of
intraocular Glaucoma. We meet with cases where there
is at once recognizable in the eye complained of, a
severe form of "ciliary" disease. When the Glaucoma takes
its origin from the region of the Iris or Ciliary body,
an inflammatory action is in some cases soon set up.
We are occasionally not consulted until the "ciliary-
disease has become well established. Here, in addition
to pain in the spectacle and frontal region and cheek,
we find lacrimation, photophobia, occasionally shallow
anterior chamber, sometimes a deep anterior chamber, and
this circumcissed ciliary injection. Pathophysiologically this
disease is not unfrequently bilateral, and there is a
a history of normal eyegight previous to the occurrence of his acute affection. As a further complication we get in some of these cases shrinking of the globe as a sequel. Here our diagnosis is by no means easy or certain, and we may find that, after the eye has remained shrunken for some time, the reimplant begins to grow and flourish out of the breast of the globe. Content pond occurs in such shrunken eyes as are the seat of sarcoma, and tenderness on pressure can also be readily elicited.

The greatest care and attention to every point together with a thorough and accurate investigation into the history are essential, if we decide to arrive at a proper diagnosis; everything must be taken into consideration, and given due weight, and its relative importance properly estimated. Because this is the second stage, when it is all important to arrive at a diagnosis and formulate and carry out a treatment, while yet the disease is probably entirely confined to the eyeball, and not diffused extraneously and infiltrating the orbital tissues.

And so now we arrive at that time when the sarcoma is no longer limited by the coats of the eye, but, having escaped from the confines of the globe, has begun to vegetate among the extraocular tissues.
Extraocular Stage.

This new phase in the life-history of the condition is attained by the infiltration of the sarcoma through the coats of the sclera. The favourite places where this penetration tends to occur are: 1, near the entrance of the optic nerve; 2, the corneo-scleral junction; and 3, along the course of naturally existing channels, e.g., the anterior ciliary vessels, veins vorticose; 4, by passing directly through the sclera opposite the original site of the growth. The exact period of the disease at which this occurs is variable. It does not necessarily depend on the globe being filled with the resplanda, because in many cases the interior of the eyeball is not by any means full when perforation occurs. The important factor seems to be the power of infiltration possessed by each individual tumour, some having this power of infiltration more highly developed. Should there be little infiltration of the coats of the eye during the progress of the case, then there will be no periocular growth until the globe is completely filled up with sarcomatous tissue. But, on the other hand, we can readily appreciate that a highly malignant, vascular, and loosely arranged sarcoma, without much or no capsule formation will readily infiltrate any time with which it may chance to come in contact, the progress of the case
being thus very speedy, and the disease shewing
early transition from the initial to the metastatic
stage. Another factor which has also some
 bearing on this question is Site, because we find
that such a situation as the ciliary region favours
fairly early termination of the second stage; whereas
it always takes considerable time for even a very
energetic sarcoma to surpass the restraints laid on it
by the tough sclerotic tissue. Now, whenever the
sarcoma ceases to be limited peripherally by the coat
of the eye, it becomes the seat of rapid increase and
development. Much of the original pain for a time
is abated, but is liable to be succeeded by a
new pain of a more neuralgic nature probably, and
diffused over the cheeks, brow, and face generally.
The tumour itself grows remarkably fast and is the
cause of a great deal of deformity and discomfort.
The neoplasm may appear in the palpebral fissure
viewing by the side of the eye, and causing
various pressure phenomena. Thus in some cases,
where it perforates posteriorly, the globe is pushed for-
ward and proptosis to a marked degree occurs.
At the same time there is considerable impairment
of vision owing to the optic nerve being subjected to
traction and compression. Hemorrhage may also in,
or
owing simply to the injurious pressure on the nerve. There may result total loss of sight in the already amblyopic eye. If, of course, should the affected eye have already become blind owing to the globe being full of the secretion, then of course this subsequent same pressure lesion will not add anything to the symptomatology of the disease in the way of visual disturbance.

The saccoma, now exposed to all the irritations and accidents consequent on its lying free on the surface, becomes the seat of certain secondary degenerative and inflammatory changes. As in other regions, where a sarcomatous tumour is exposed to the influence of agencies external to the body, it begins to ulcerate. With this complication we get the formation of a considerable quantity of pus of a very foul smelling and offensive character, rendering the proximity of the patient in some cases the source of disagreeable odours.

Again, owing to the entire want of support to the blood vessels of the tumour, the embryonic and delicate vessels tend to rupture, and blood extravasation occurs. The bleeding is of frequent occurrence and constitutes a well-known feature of this stage of the disease. Hence we find some of the older writers in referring to this morbid appearance,
appearance, giving the disease the name of Fusceo-
Hæmatodes. As I have indicated, the bleeding
may occur on the free surface of the growth; but
in some cases it may occur immediately under the
surface, or in the substance of the neoplasm. In
each case it may collect and give rise to a cyst for-
nation with thin smooth walls. The blood undergoes
degeneration, and we find inside the cyst a chocolate
brown fluid, which on microscopic examination is
seen to be made up of blood cells altered in shape
and conformation, with free pigment and debris. I
shall refer to a clinical case of this nature which
occurred under the care of Mr. George Berry (Case 1. p. 58.)
(also in p. 52).

The tumour, in this its intracocular stage, now
attains a fairly large size, its growth being un-
restrained by any boundary or capsule. In its un-
checked growth it may proceed until we have a
large fungating, ulcerating, bleeding, mass of tissue,
reaching at times the magnitude even of the closed
fist and presenting a most gruesome aspect, the
unhappy possessor of the growth being an object of
pity and commiseration, and becoming every day
less and less amenable to surgical relief.

So far, as we have seen it, the tumour has
been quite local, and confined to the eye and its
more immediate environments. But we have to bear in mind that Sarcoma is one of that group of growths which are Style Malignant, and all such growths manifest a very important and ominous feature; that feature is of course connected with spread of the tumour to remote parts of the body or metastatic growth. Sarcoma of the eye seems by no means an exception to this rule. We have therefore that a fourth or metastatic Stage must now be described in order to complete our review of the disease under our consideration, and we shall now proceed to indicate in what way and by what channels Sarcoma manifests its proper malignant features.

In discussing the pathological characteristics of Sarcoma, we showed that the cellular elements of the tumour are closely built together, and the vascular arrangements are constructed in such a way, that the whole tumour is practically permeated with vascular spaces and channels. The walls of these vascular channels are very delicate and indeed in some cases are quite wanting, the blood simply flowing along canals whose sides are constituted by the cellular tissue elements themselves. It is as one readily appreciable how easily Sarcomatous cells can be dislodged into the blood stream, which
which carries them out of the tumour and hurries them off to distant parts. Consequently we find that Sarcoma tends to spread by the vessels and not by the lymphatics, and hence the Preauricular gland does not become affected by Sarcomatous enlargement in distant Sarcoma, although we find that it is early affected in Epitheliomatous tumours of the eye and its appendages. In the latter case the spread is by the lymphatic channels.

In this general rule that Sarcoma spreads by blood vessels alone we must make mention of some except.

Cases, apparent or real, may have been by vascular extension via the Facial vein, and thence by the various anastomoses of the Facial Communicating veins and the various maxillary branches of Vena to the Submaxillary gland. Such glandular affection however cannot be said to be by any means common or usual, as the internal organs tend to be the recipients of the cell element of the neoplasm, and the lungs, liver, abdominal organs, and bones become invaded by the malignant tissue, the secondary focus finding in these regions a suit-

able lodgement and nutritive soil for growth and
enlargement. In such cases, by their interference with the functions and metabolic processes of the organ they lodge in, these secondary deposits tend greatly to lead to the exhaustion of the unfortunate patient's strength, and finally cause his death.

This process of metastasis may have occurred some time before it causes any functional disturbance or evidence of its presence, and this fact is of importance for us to remember in estimating the prospects of any given case. Suppose that an eye has been examined for intravascular neoplasms, and that we found the tumour apparently was quite limited to the interior of the globe... and, so far, as we can now judge, carefully examining the organs of the patient, no other part of the body shows a trace of the disease — are we to say that the patient is free from his disease altogether, and that no recurrence will take place either locally or at a distance? To such a question the answer is — we must wait for a time and observe our patient carefully, because metastases may already, even comparatively early in the disease, have occurred and have caused no symptoms nor signs, and yet these may appear after an interval of months or even years, undoubted mani-
manifestation that such a metastasis has occurred.

Let the surgeons therefore be guarded and not

given without due consideration and careful exami-

nation of the viscera, always bearing in mind

that the metastatic deposits often remain undetected

and undetectable for a considerable period of time.

The case in the foregoing manner indicated the

nature of Omental Sarcoma, and it will be conve-
nient at this stage dwell for a little on the fea-
tures of the cellular form of Sarcoma, that is to say

Glioma. This peculiar and interesting tumor growth

is really a Sarcoma affecting neuroglia connective tissue,

and according to some observers identical with

ordinary round cell Sarcoma. We find this

tumor attacking the retina, in whose connective

tissue it takes origin. Like all Sarcomata, it has

a tendency to degenerate change, which in some rare

instances renders the tumor "auto-cancerous", if I

may use such an expression. The tumor mass

grows both forwards and backwards.

Clinically, it can be seen as a peculiar whitish

growth vascular tumor in the posterior part, generally

speaking, of an infant's eye, the eye affected being

blind and having a dilated and reactive pupil.

The disease growing anteriorly presses on the lens,
and how renders it opaque, in addition to bringing it forward into the anterior chamber, which becomes thereby considerably shallower. In the course of time the humour infiltrates through the cornea and gains the exterior of the eye. Occasionally, but not so commonly, we find it piercing the sclerotic coat. The cornea gets damaged by pressure, or by infiltration, or by a low form of inflammation consequent on trophic disturbance. The disease, spreading backward, also leads. The optic nerve being perforated by glaucomatous tissue elements, the centre of the nerve being first invaded, and subsequently the peripheral portion of it, vascular metastasis is shown. When it attends the development of the humour, follows exactly the same course as that taken by Sarcoma. Yet general metastasis is not by any means the rule in Glaucoma. In this relation it is necessary to say a word, because metastasis is so limited in its distribution in the case of Glaucoma, owing to the fact that when the Glaucoma extends to the brain, death ensues before there is any time for the formation of secondaries in other organs. Indeed, it is the custom of some authors to omit this stage of metastasis in their description of Glaucoma, because the brain is rarely always first affected, death occurring,
occurring, and preventing the manifestation of any further metastatic deposit. Now Sarcoma proper differs widely in this respect, as its tendency is to its itself sooner or later as a secondary growth in the lungs or abdominal viscera.

I should like here to refer to a point which is of much interest, namely, that Glioma sometimes makes its appearance in both eyes at or about the same time. This peculiar condition has been recorded on several occasions, and one is led immediately to think that the occurrence in both eyes must have been the result of primary glioma in one eye succeeded by secondary glioma of the other eye. But such is by no means the case, for in some of the instances examined both optic nerves have been found healthy, nor has any implication of the brain been detected. So that the theory that in double glioma one tumor is secondary to the other is not in every case tenable. One certainly does not frequently meet with the dual presence of primary malignant disease in the body, but we may cite the occasional and rare occurrence of multiple sarcomata. Strangely enough multiple sarcoma also occurs in an epithelial tissue viz., the Skin, or more correctly in the connective tissue of the uteri vera.
In making a diagnosis of this disease one is called in the first stage to differentiate Retina from melanotic Sarcoma by noting the absence of the appearance of any pigmentation in the growth. Retina is of an opaque dense white aspect, while melanotic Sarcoma always shows a black or brown coloration in at least some part if not throughout. From these features, Retina can be differentiated by noticing the fact that the latter is arising in and growing from the Retina itself, and that the retina and tumour are continuous, and further, that the retina is not simply lifted up and pushed in front of the advancing tumour. Moreover, the patient suffering from Retina is quite young and infantile, while the Sarcomatous subject is, at any rate in the majority of instances, much older.

Intraocular disease (in the form of tumour) of the Retina is not infrequent and presents features greatly resembling Retina, so closely indeed that in many cases it is impossible to diagnose between the two with absolute certainty; and often one cannot tell whether a given case is Retina or Intraocular tumour until the eye has been examined under the microscope. In some cases, however, we may be able to recognise
recognise that the ophthalmic tumour is paler and denser, and as compared with the slightly tufted aspect of the ophthalmia. In the many cases of the former there a number of vessels running over the surface of the growth, the vessels lying in the fibrous capsule, which is generally found surrounding such constitutional tumours. And so again we have difficulty and doubt arising.

Another disease which we have to be careful not to mistake for ophthalmia is what has been termed by some Pseudo-ophthalmia. At first sight, Pseudo-ophthalmia looks very similar to true ophthalmia; and, if the cornea media be somewhat less transparent than normal, we may have considerable difficulty in coming to a conclusion as to the exact nature of the condition. Even, however, in clear vision and time, we may note that the Pseudo-ophthalmia is paler in colour than true ophthalmia, that the deposit of tumour does not conform to the usual shape of ophthalmia, i.e., that it is less rounded, and that the tension of the eye is diminished, the latter point being a very noteworthy clinical distinction from ophthalmia. On enquiring into the previous history of a case of Pseudo-ophthalmia, we find that there have been antecedent illness, headache, and pyrexia, together with other symptoms pertaining to Epidemic Carbom-phinal.
The connection of the latter disease with glioma is the following: one of the sequelae of this somewhat rare disease is metastatic or suppurative choroiditis, which comes on acutely with severe pain in the eye, and marked constitutional symptoms including aganit vomiting. After the intensity of the inflammatory process subsides, there remains a mass of lymph in the vitreous chamber which may extend from the front to the back of the interior of the globe, and may thus closely resemble a neoplasm coming forward from the back of the eye. Among the other distinguishing features, however, we note that the anterior chamber gives valuable information, as we do not find the anterior chamber shallowed in Pseudoglioma, nor do we find the tumours of the eye remain in these old metastatic choriditic cases; but instead we find in some cases rather a deep aqueous chamber, peripherally owing to presence of adhesions drawing the peripheral portions of the iris backwards to the deposit of lymph in the vitreous. In addition, the patient is otherwise quite healthy and there is no

† We may note here some other causes of Pseudoglioma, which occasionally occurs by injury to the eye. The eptic diseases elsewhere. The suppuration following vaccination.
no hereditary history of a suspicious nature. (See p. 62)

As contrasted with the foregoing, ooze has occurred in the eye of a previously healthy young child, whose parents, not having observed the child to suffer from any symptoms, have merely inferred from the peculiar appearance and ways of the child that their child is blind in the affected eye which was probably shewn a whitish reflection in place of the 'black pupil'.

Showed these circumstances happen by any chance to have escaped the parents' notice, then the distress of the little sufferer, as the exudation increases in bulk, cannot fail to be remarked and lead to advice being sought for the child.

Having now completed the description of the varieties of intraocular sarcoma, we have still to mention those examples of the disease which affect the outside of the globe and its vicinity. Shunting first of the Conjunctiva, we find that Sarcoma occurs here on very rare occasions. The few cases which have been observed have, as a rule, been of a pigmented nature, linear Sarcoma being nearly invariable in the rare site of Sarcoma. A peculiar feature of the growth of metastatic Sarcoma of the Conjunctiva is its tendency to increase in height, and not to spread so much in superficial area. Consequently it tends to have
a comparatively narrow base, and shows a distinct petiole. This is a happy state of affairs as it enables us the more readily to deal satisfactorily with it, and the operator feels that he can remove the whole growth in its entirety with little fear of recurrence.

Mr. Martin McHardy in the *Illustrated Medical News* of 1888 refers to a case of metastatic Sarcoma of the conjunctiva and subconjunctival tissues. These tumors have been said to take their origin from injury, but others from congenital spots, innocent or congenital pigment spots may occur on the sclera in dark complexioned people, and differ from Sarcoma in that they are of a brown or slate color, never black. The degree of malignancy is inversely as the age of the patient, and they rarely, if ever, invade the globe.

The usual site is the junction of conjunctiva and sclera.

The Ciliary Gland is occasionally the seat of Sarcoma. When it is, the tumor takes its origin in the connective tissue framework of the gland, or arises from the gland capsule. It makes its appearance as a rapidly growing orbital tumor springing from the outer side of the eye, which becomes pushed downwards and backwards, the inner side, that is to say, it produces downward and inward proptosis. The new-growth also causes bulging of the upper lid, and may appear at
at a late stage as a reddish swelling, tending to ulcerate and blur on its free surface. The disease in this situation is a rare one: the position of the swelling and the direction of the process sufficiently indicate its probable origin, while the general features of sarcomatous growth show us the nature of the swelling. Affections of the orbit in healthy eyes may be mistaken for it, but the absence of pyrexia, fluctuation, and cutaneous oedema serve to keep the diagnosis from error.

When Sarcoma affects the Sclerotic tunic of the eye, it usually does so by reason of involving that coat in its spread out of the eye when it has previously originated in another region, i.e., the subjacent choroid coat. This affection of the Sclerotic therefore is secondary in its nature. In very rare instances is the disease in this situation primary, and on this account we need not dwell on such a comparatively unimportant phase of the disease.

Sarcoma of the Eyelids has been noted as of very occasional occurrence. It takes its origin in the connective tissue of the lids, and seems to be usually in relation to the tarsous orculi. When seen, it has been most frequently pigmented, and tends to cause, curiously enough, glandular enlargement.
Why this should be so, it is extremely difficult to say, but it is probably due to the free lymph circulation, which is present in the loose tissue of the region, allowing some of the sarcomatous cell elements to enter the lymph stream and be swept to the nearest lymphatic glands, which then filter out the malignant cell elements and retain them. Thus the glands do with the customary harmful results.

We have already had occasion to refer to the presence of sarcoma in the orbit, and here we can trace its origin to one of two sources. In either case the physical manifestations of the disease are practically the same, and have already been described under the head of the third or extrasinus stage of intraocular sarcoma. It may thus be the manifestation of an intraocular primary growth transgressing the limits of the globe, or it may arise in the first instance outside the eyeball among the Tenonian membranae and connective tissues, from the bone, peristeam, or sheath of the optic nerve.

These extrasinus sarcomata may be differentiated from primary intraocular sarcoma growing outside the globe by these circumstances: i.e., that the eyeball is not at all affected at first; pain occurs only when proptosis is marked; there is no blindness nor even
even Amblyopia until the optic nerve has become inv-

olved by pressure or neuritis; there is no intra-
ocular opacity, nor any detachment of the retina,

nor any Sertoma; and the tumour is surrounded
by a more or less distinct capsule. When the eye is
being pushed to one side, (and, by noticing the
direction in which the eye is pushed, we gain a
due to the probable point of origin of the tumour),
diplopia is often noticed by the patient, and is due
to the altered relation of the visual axes of the two
eyes. Metastasis of course occurs in these cases in
common with other similar new growths, but here
again we have to take note that, as in Cylid
sarcoma, lymphatic glandular enlargement is known
to make its appearance after a certain period of time.

Such then is the clinical history of this very
interesting class of tumour growth, and now it re-

mains for us to consider what means we have
at our disposal for the cure or relief of the unfort-

unate patient. Most unhappily, we are able
to do but little to successfully combat the dire
effects of these malignant growths. The

meaning treatment at our command are very few, and, such
as we have do not enable us to assure our patients
that the employment of these remedies will certainly
relieve them of their remedy. The most we can do is but little, and only too often are we confronted with melancholy cases of recurrent growths only a short time after we had apparently removed all the disease. Even if we do not meet with any reappearance of the neoplasm in its original site, instances are not wanting where metasts have made their appearance in distant organs some considerable time after the radical operation had been performed. Our treatment therefore of these new growths is not by any means anything to boast of. Still, we must not be supposed to suggest that nothing ought to be done for our patients. On the contrary, such means as we have must be used by us with the utmost care and conscientiousness, and it behooves us to make the best use possible of our scanty resources.

In every instance the indications for treatment are the same, whether the patient suffer from Sarcoma or Glioma. Both of these mentioned have already been shown by us to be of malignant character, and the treatment, to be of any avail whatever, must be radical. No half measures will suffice, indeed they are worse than useless, as they merely serve to act as irritants, and stimulate the disease to renewed and more vigorous growth. We must re-
remove all the disease as completely as is possible, and to gain this end we must cut wide of the apparent limits of the disease. The free use of the knife combined with the application of various caustic agents are the manner in which we deal with this malady, and in some cases good results have thereby been obtained of a immediate nature in most cases, and occasionally of a lasting character.

Should the growth have arisen in the Conjunction, where we noted the disease was predominate to a great extent, their removal can be affected by simply cutting it away from its connections, and then applying thyme paste to the raw surface left after its removal. The utmost care is essential however in doing this that we do not use our manipulations spread any of the morbid tissue elements to other parts of the eye. Therefore it is necessary to lift the tumour up from off the conjunctiva, and pulling it well forward, cut it freely away.

Limited Sarcoma of the Corneosclerotic junction has been excised, the globe not being sacrificed. This conservative procedure however is not one to be recommended, as it does not act up to the excellent general rule that the organ containing a Sarcoma should be removed along with the Sarcoma.
In the great majority of instances we must act more radically, and, whenever our diagnosis is made we ought at once to remove the organ in which the disease originated and in which it may now happen to have extended to, no matter in what site or at what stage it may now be. In intraocular cases indeed, enucleation is the only method of treatment which seems to offer the least prospect of success, and which meets most of the therapeutic indications. Should metastases already have occurred, enucleation cannot be of any avail to avoid it, and as we are often quite in ignorance as to whether metastatic growths have or have not occurred, we must await the expiry of time, which alone can afford us the evidence as to the success or failure of our therapeutic efforts.

If the disease have reached the intraocular stage or formed the case be genuinely one of orbital sarcoma, then the eye must be first enucleated and the whole content of the orbit thoroughly removed, every piece of suspicious tissue being dealt with. The resulting cavity may then be swabbed out with strong solution of Chloride of Zinc, and Zinc paste or Vinal paste applied to the raw surface. The suture, having been spread on strips of lint, is laid
laid in the orbital cavity, and cotton wool is placed
over these strips. The conjunctival folds left after exu-
dation are spread over the dressing, a layer of
balsam is applied over the advented conjunctiva, and
the lid closed over the whole. It has to be borne in
mind, however, that the application of Vincam pastes
is not altogether free from risk, and there are instances
on record where the use of this caustic was the
means of setting up a fatal meningitis. Should
any growth makes its appearance after removal, then
such recurrence must be dealt with as it appears,
every case having to be considered in view of the
presence or absence of metastatic formations, and
the condition of health of the patient. Whether the
knife or cautery or caustic is ought to be employed,
depends on the nature and extent of the recurrent
growth.

In cases of primary Orbital Sarcoma it has been
attempted to remove the tumour without amputating
the eyeball. I cannot think that this can be a
good method of treatment, so far as it is not
possible to be even moderately certain that the
disease is all removed by such a procedure, owing
to the difficulty of access when the eye is still in
situ. When the growth has ramifications out of
Our knowledge or reach beneath the globe and around
the optic nerve, it cannot be dealt with, (or even
recognized sometimes) until the eyeball is removed.
It seems to be a much better advised operation to
remove the entire orbital contents in every case where
sarcoma is diagnosed, and then, having dealt thus
thoroughly with the disease, we have no reflections
nor regrets should any recurrence make its presence
manifest at a later date.

In fact, the principle of treatment in all our
cases of sarcoma of the eyeball and orbit might be
very tersely epitomized if we were to say, 'whenever
the disease is recognized as sarcoma, at once re-
move it together with the organ in which it is
growing,' and if it be in the binner outside the
eye then remove the eyeball, the growth itself, and
as much of the surrounding tissue as possible or is
necessary. The early and thorough surgical inter-
ference we give the patient which is really, so
far as we at present know, his only chance;
and, always bearing in mind how deadly is the
disease we are dealing with, we should neglect to
do nothing which promises to give the slightest
benefit to our patient either in the direction of
cure or amelioration of his sufferings.
Germong in Munch. By Dr. Koch, in Sept. 3rd 1898 announced that he has tried injections of the usual toxins of Erysipelas and Bacillus prodigiosus, using Coley's method, for the treatment of cases of Sarcoma. His case was one of infectd Sarcoma. After 18 injections the tumour became in size, got soft, and the pressure symptoms, e.g., facial paralysis, disappeared. Apparently the injection of these substances exerted a specific influence upon the disease. The injection causes fever and local inflammation, signs which disappear however after a few hours. It cannot be regarded yet as certain that this treatment can be relied on and, so long as it remains uncertain, ought only to be tried in recurrent cases. We may, however, be on the eve of having an additional and valuable method of treatment to use in our cases of Sarcoma and we shall welcome any such addition to our present somewhat imperfect armamentarium.

I have endeavoured to state in as clear and concise a manner as possible the chief and outstanding features of the pathologi conditions under our consideration and, before giving a few clinical examples of cases which I have had the opportunity of observing, I should like cite a few illustrative cases published by several authors, and which seem to me to
Points mentioned above by me.

Glaucoma complicating Intraocular Tumour.

In the "Medical Times" for September 25th, 1875, Mr. C. Bell Taylor mentions a case which, when first seen presented the clinical features of acute Glaucoma. The pupil was wide, fixed, and dilated, and the tension raised (+3). There was a history of diminishing vision for some time, and in this connection we could enquire whether each eye was separately tested, because, if not, it might have been discovered that the affected eye was quite blind, the diminution of vision being due to one eye being well, but being hemiposed by the other amaurotic eye. In this case an enucleation achieved pain but did not improve the sight, and symptoms recurred in six weeks. The lens was then extracted with benefit to the patient. Tumour growth was now for the first time suspected and the eye removed (three months after the patient was first seen). A section of the globe a melanotic tumour was discovered. The vitreous in addition was thickened.

In another case the patient complained of failing vision. All that could be detected after careful examination was a tumour of the optic division
one side. The improved under the hypertensive administration of strychnine, but after a time the patient got worse and the same underwent atrophic change. Eight months later, acute glaucoma was found to have symptoms an iridectomy gave relief. That in six weeks owing to a relapse the eye was enucleated, and a tumour which had burnt the conjunctiva of the globe was found. The patient was seen two years afterwards and was then in good health.

'Insir at which Perforation of the Scler occurs.'

A case is recorded by Mr. Lawrence in the Medical Journ. May 16th 1856, in which a metastatic tumour was known to be present inside the globe for five years before becoming extracapsular.

Dr. E. H. Burnett (Chamert 1889)

saw a patient 5 years previously suffering from an Intracapsular Tumour, and who had had a fluctuating and heaving extracapsular growth.

Occurrence of Primary Cystic Tumour.

This has been noted by Mr. Lawson, as occurring in the form of a multilocular growth arising from the 'plaque' &c. Microscope examination of
of it showed a number of different varieties of cells, with all gradations between spindle and epitheloid cell, many of them being of a distinctly embryonic type.

Date of Appearance of Metastases

In those records, a case where metastases occurred in the liver 9 years after removal of the sarcodones eye. In this, the clinical features resembled greatly an example of metastasis of the liver.

Double Glaucoma

This is sometimes not primary in both eyes, but occurs in one eye first, the second eye being afterwards infected. Dr. Thalberg mentions a case where glaucoma of one eye perforated to the outside of the globe after being intraocular for 2½ years. The other eye became glaucomatous, evidence of the extension by the optic nerve, and chiasma being demonstrated after death. – Le Kearn 1885 Wet. p. 1885.

Bendo-Glaucoma

The British and Foreign Medical Climax and Review for 1837 contains the account of a case of Bendo-Glaucoma of the eye. The case was one of choroidal effusion under the retina which got separated from
off the choroid, and became pressed along with
the thinned vitreous into the centre of the globe.
This dilated mass of tissue looked just like a
 tumour. The lens became opaque and was pushed
forward till it came to lie in contact with the
back of the cornea. The presence of tumour
 together with a history of pain in this case, however,
ought to have militated against a diagnosis of
tumour.
Clinical Report of Cases which have come under
the author's personal observation.

Case I. Sarcoma with Blood Cyst.

The patient was a little boy aged 3 years, who
came under Mr. George Henry's care at the Edinburgh
Royal Infirmary in 1873.

The parent first noticed some slight degreeing
proptosis about a year before admission, and this
gradually increased. On admission there was
to be seen considerable proptosis of the affected
eye, which was directed downwards and outwards.
There was a marked fluctuating swelling under
the lower eyelid, but no pulsation, and pressure
on this swelling increased the proptosis. No mani-
festation was successful in inducing the eye to
return within the orbit. The pupil reacted
slightly to light, but its reaction to accommo-
dation could not be elicited. The child was
feeble and ill-nourished. Ophthalmoscopic examinat-
on proved negative, no disease of the fundus
being present. No glandular enlargement was present.

An incision was made into the lower lid, and
a tumour was exposed subjacent: it had on its outer
all the appearance of a portion of rabbit’s intestine, being smooth and somewhat glistening. The anterior wall of the cyst was removed, and immediately about 2 oz. of a dark chocolate coloured fluid escaped. A drainage tube was inserted, and free exit for any discharge ensured.

The cyst wall was examined microscopically, and was found to consist of condensed connective (fibrous) tissue. The fluid was of the nature of attested blood, and contained broken down and degenerated blood cells, debris, and blood vessels.

After the operation the eye returned to normal position within the orbit, but, notwithstanding the maintenance of free drainage of the sac, the posterior again became wanting, and as the globe itself these signs of beginning to be affected, the cornea became ulcerated—encephalitis was decided upon and carried out. The back of the orbit was then found to be occupied by a sarcomatous tumour which was removed.

Here we had evidently to deal with a sarcoma, in which a haemorrhage occurred, infiltrating the tumour in a forward direction, and causing constantsation of the tumour in its course. Such a case is very difficult to accurately diagnose, and often we
we are uncertain as to the exact nature of the case until the swelling is cut down upon and explored to view.

Case II. Tumours of Conjonctiva resembling Sarcina.

The patient was an old man aged 70 years, who came under Mr. Buruj's care in 1873. For 5 years the patient had suffered from an ulcerating growth of the inner part of the ocular conjunctiva. This had gradually extended until on admission to hospital it occupied the whole of the inner part of the conjunctiva and in addition the adjacent part of the cornea, extending nearly up to the pupillary area. The growth presented an irregular ulcerated surface covered with pus. There was no pain complained of, and no precurvatur or other glandular enlargement. The edge of the cornea near the tumour was of a salmon colour due to vascularization and delimitated the clear healthy corneal tissue from the growth. The ocular muscles were quite unaffected, and the movements of the globe being perfectly free in all directions.

The disease was attached with a small, sharp, focus and was freely drained away. This was a comparatively easy matter owing to the direction of
the time, no resistance nor hardness being encount-
ered. The whole was therefore got away, abscess
having drained on the raw surface, and the healthy conjunct-
iva above and below submerged. Healing occurred
satisfactorily, but the patient left hospital before
this was quite completed.

Unfortunately no microscopic examination of the
primary abscess was made, but, from the thickness of the
thickening and the little infiltration of tissue which had
occurred in so long a time as 5 years, it is
probable that the true nature of the disease was
intraocular - an instance in fact of lupus of the
Conjunctiva.

Case III. Orbital Sarcoma.

In this case the patient was a man of the age
of 58. By trade he was a tailor and at his
work sat usually in the line of a draught, which,
according to his account gave him a cold in
January, 1873. At that time his right eyeball became
swollen and stiff, and remained so for a week. A
month later, when out driving, his eye for a
decade time became severely affected, but this time
it failed to subside. In addition he had asea
Severe pain in the head extending over the right side of the vertex, and down to the angle of the jaw.

Becoming no better under treatment, he came into hospital under Mr. Burns's care. On admission, about three months after the first affection of the eyelid, the right eye was seen the prominent and somewhat divergent; there was slight chemosis on the inner side of the eye, and a little nodule could be felt just outside the upper inner angle. There was some puffiness of the upper lid, particularly toward the inner side, and on pressure at a point above the centre of the eyeball there was slight distinct tenderness.

The sight of the eye was quite unimpaired. Diplop
ea was occasionally present. There was no glandular enlargement, but the patient was losing flesh, getting thinner and weaker.

Enucleation of the right eye was performed, and after this was done, a tumour was found occupying the back and upper part of the orbit. The tumour of the orbit, including the parietes, was thoroughly removed, and the cavity filled with Roscoe's powder, firm pressure being maintained by means of a pad of wool. Although to all appearance every trace of the disease was eradicated, the patient returned in rather less than a month.
with recurrence of the disease about the inner canthi.

The lacrimal and submaxillary glands were now enlarged, - a rather rare and uncommon feature - in sarcoma of the orbit, - and a marked swelling over the frontal region seemed to indicate the recurrence of infiltration of the malignant growth into the frontal sinus. The patient, for whom nothing further could be done, returned to his home where he died in the course of two months.

This case showed somewhat unusual features in that there was distinct glandular enlargement, though very rapid recurrence. The latter is not quite so uncommon as the former, but in the old one does not expect to find it only a return of the disease.

Microscopic examination showed the tumor to be a fibrous tumor. Primary pigmented tumors are not frequently met with in the orbit.

The glandular enlargement, which occurred, must have been the result of blood vascular spread of the disease, or may possibly have occurred after the free removal of the disease from the orbit, free absorption from the raw surface remaining, and effusion - metanepithelial and some sarcoma cells which had escaped removal being carried to the nearest gland.
Case IV. Intraocular Melanotic Sarcoma.

This occurred in a woman aged 62 years. The history presents some features of interest. The patient stated that 2½ years previously she was hit with a corkscrew rather severely on the right eye, and, though she could not say definitely, very possibly the globe was struck at the same time and a shock given to the eyeball itself. About 3 months afterwards, she noticed something growing over the globe of the right eye, which was not at that time painful, however. The eye has remained in the same state up till 2 months before admission, when the eye became painful, and the sight became rapidly impaired and finally lost.

On admission there could be seen over the front of the cornea a hazy ground-glass-like appearance; long conjunctival vessels were seen running into this from either side. There was slight conjunctival venous dilation. The iris was discoloured and had assumed a yellowish green colour, the other and healthy iris being grey. The pupil of the affected side was slightly smaller than the other, and did not react to light. The right anterior chamber was shallow. At the outer side of the iris there was seen coming in from
the ciliary region a dark almost black body with a somewhat circular edge, giving the observer the impression that a whole growth, if regular in contour, would be about the size of a pea. Below this, and separated from it by a portion of healthy iris, was another smaller black body of similar appearance. The tension of the globe was greatly increased (T+2). In the affected eye there was not even perception of light.

At first sight the black body at the side of the iris resembled greatly the condition known as iris-striae (in which the peripheral portion of the iris, i.e., its attachment, is partially ruptured); but careful examination negatived this, and indicated that the case was one of metastatic sarcoma of the ciliary region.

The eye was accordingly enucleated, and the tumour was found to be a beautiful examples of pigmented sarcoma of this I have prepared some specimens and shall describe in detail the pathological and histological features of the growth.

Naked eye appearances of the tumour mounted on slide.

The tumour is small roundish and pear-shaped, and is attached to the inside of the eye at the corneal interst.
- sclerotic junction immediately posterior to the peripheral attachment of the iris. The sclera is somewhat thicker at this point. The central portion of the iris is quite free and normal in its relations. The retina and choroid are detached from the sclerotic posteriorly, and with these two structures the new formation is intimately connected. The tumour is pigmented, but not equally so, some portions being deeper in colour than others particularly near the sclerotic and choroid.

Lox Bower.

The sclerotic shows normal in almost every respect: one can notice a slight degree of thickening at its junction with the base of the tumour, and at this point there is apparently a slight infiltration of melanotic cells, extending for a very short distance into the substance of the sclera. The cornea is normal.

Iris. The periphery of the iris is embedded in a mass of pigmented tumorous growth which extends from the main body of the neoplasm forward to the front of the iris, along which it runs for about 1/3 of the length of the latter. The tumour itself springs from the ciliary region and lies close up to the sclerotic. Its attached base is fairly broad, and it seems to grow directly out of the inner surface.
of the sclera. From this base the tumour spreads out and assumes a somewhat globular shape, as it projects into the interior of the globe. Only on the anterior surface is there anything of the nature of a capsule to be seen. At other parts of its circumference the tumour has no limiting membrane of any kind. At its peripheral attached surface it spreads forward as previously mentioned to the point of the iris, while posteriorly it passes among the external layers of the choroid, between the pigmented coat of that membrane and the sclera. The pigmented layer of the choroid is ruptured and turned inward, at a point a little posterior to the place of reflection of the Conjunctiva from off the sclera. The ruptured and dislocated choroid can be traced for a considerable distance into the substance of the tumour.

Posteriorly, the Retina and Choroid are detached from the sclera, in part possibly owing to the preparation and cutting of the specimen, but largely as a result of the presence of the tumour, as shown by the presence of a large amount of tissue lying between the retina, pigmentation and sclera a little further forward. The retina as it passes towards becomes more and more squeezed by the tumour growth against the pigmented choroid, until
until its structure becomes barely distinguishable.

The new growth itself is dense, and in various areas shows spaces full of blood cells. It is pigmentated throughout, but some portions display a considerably greater amount of colouring matter than do others. In the most part the pigment is black or greyish-black, and in some places dark brown in appearance.

High Power.

One is able to verify everything that has been above described, and in addition can make out some additional important points, including the intimate structure of the tumour. Manifestly, the growth is a Melano Sarcoma, and it consists for the most part of all elements crowded together with quite an inconsiderable amount of intercellular tissue. The cells are of many different kinds, all possessing well marked nuclei, and distinct cell walls. In shape they are most generally rounded, some however are spindle-shaped, and others irregular in outline, owing no doubt to the direction in which they have been cut. Some of the cells contain more than one nucleus. In some parts they are simply crowded together and by mutual pressure give each other varied and sometimes angular shapes. In other parts of the growth they have a more or less definite grouping, being arranged in bundles.
which run in many different directions.

Throughout the substance of the growth run numerous vessels, some of which have well-defined walls, while others have simply a thin delicate lining of flattened cells intervening between the cell elements of the tumour growth and the blood stream. Others again possess no walls whatever, simply consisting of blood spaces placed here and there among the tumour cells.

There are to be seen at several places small recent extravasations of blood, undergoing, where not quite so recently affected, retrograde degenerative changes.

Some of the blood vessels contain a few round cells not unlike sarcoma cells. Indeed many of them closely resemble and are probably identical with some of the small round cells of the growth which surround the vessel wall, and at some points appear to be passing through the vessel wall to reach the lumen. This has a very important significance, for if these really be sarcoma cells, then we have an example of one of the ways in which metastasis occurs, viz. by the malignant cell elements being carried away in the blood stream from the tumour to distant organs. The patient, in whose case this tumour existed, presented no signs of any secondary growth in her organs, but
not infrequently some time elapses until metastatic
growth becomes recognizable, and one must be
exceedingly careful in giving an opinion that no
metastasis is present.

No lymphatic vessels nor lymph spaces can be
detected in the tumour, which thins is seen to be
composed of tissue of a very cellular and vascular
character, and consequently is, clinically speaking,
of a highly malignant nature.

One other point regarding the sarcoma cells, may
be noted, viz: that they show granules of apparent
degeneration in their protoplasm. These pigment
granules are placed inside the sarcoma cells, but in
some cases were free outside the cells altogether.

**Case V. Intra-ocular Lago-Sarcoma.**

This case is very instructive when a comparison is
made between the features it presents and those
we have studied in the preceding case. The patient,
from whom the tumour was obtained, was a woman
aged 66 years. Six months before admission under Mr. Berg's case, the sight of the left
eye began to fail, but without any access of
pain, nor any subjective symptoms such as flashes.
of light or colour phenomena. Four weeks before
admission there was sudden increase in the sight
disturbance, causing the patient to come to hospital
for advice.

On objective examination there was apparently nothing
wrong with the eye complained of. The pupil was
not dilated — dilatation of the pupil being a common
feature in cases where there is much amblyopia — but
it did not react to light readily. The tension of
the eye was slightly minus. Temporal half blindness
was detected; it was almost complete resembling a case
of central lesion of the optic chiasma, except in so
far as it was unilateral. By the ophthalmoscope
there was at once seen considerable detachment of the
retina in the area corresponding to the temporal annula-
res, that is to say, on the nasal side of the disc.
It was irregular at its edges, much elevated above
the normal level of the retina, and at one point
was raised into a somewhat globular shape.

The general health of the patient was excellent in
every particular, and the looked sound and robust.
She complained of no pain and never had had
any in the eye, head, or face. She was advised
to return in two weeks, and at that time the
blindness had become more marked, the tension of
of the eye was normal. No other features had made an appearance, and the other eye was normal.

Examination of the urine showed no evidence of kidney disease.

Some doubt existed as to whether this was a subretinal haemorrhage or a choroidal sarcoma,
causing secondary retinal detachment. As the eye tension was not increased, the difficulty was made
greater. The eye, however, being practically useless so far as sight was concerned, it was decided to
enucleate it. This was accordingly done, and on cutting into the globe, a large lens sarcoma was
found arising from the choroid and displacing and pushing forward the retina. It occupied about
one-fifth of the entire capacity of the eyeball.

The retina was detached for an area even greater than that corresponding to the neoplasm arising to
the occurrence of serum effusion resulting from the presence of the growth. This area of additional de-
tached retina was not very large, although in some cases it is so extensive as to involve the
whole retina, while then assumes a characteristic shape, viz., funnel shaped, the apex of the funnel
being at the entrance of the optic nerve, and the
base at the lips of the fossa.
This tumour was remarkable in its symptomatology, in having so few subjective symptoms, thickness in fact being the only one and it was of a remarkable and somewhat misleading nature. Also in having no increase, but rather a decrease, in tension, owing probably to the growth having no relation to the system of lymph circulation described earlier, and also to the fact that there were no inflammatory process set up in connection with it; the growth in short was still in the quiescent stage.

**Pathological Characters**

**Naked eye.** Sections of the tumour mounted on the slide show it to be of a solid nature with a considerable number of fairly large blood vessels. The tumour consists of a larger posterior portion and a smaller anterior portion, the latter reaching as far forward as, and coming into relation with the base of the optic processes. Neither the optic processes nor the sheath are involved, however; both lie quite free and in the naked eye appear normal. The retina can be seen to be detached posteriorly to the lamina. The above points are at once verified, and in addition it is found that the tumour is of very cellular nature, for the most part unpigmented, but
but in various areas e.g. posteriorly in particular there
is a certain amount of pigmentation. The bulk of
the growth, notwithstanding, may certainly be called
basal sarcomatous. Numerous blood vessels are seen
throughout the substance of the tumour, and in
many areas can be seen evidence of haemorrhage
both recent and old.

Posteriorly the choroid is in situ, while the
retina is completely detached, but as you pass for-
ward the choroid is seen to be pushed out of
place by the tumour, which in fact has encroached
the position of the choroid to such an extent that
only here and there can traces of choroidal pigment
marring the former site of that membrane. At the
front of the tumour is reached, however, the choroid
again becomes visible behind the gliding process.

Although the growth increases very markedly on the
inner surface of the sclerotic, there does not appear
to be any actual infiltration of that part by
the tumour growth.

__High Power__.
The tumour consists of well marked
sarcoma cells—They are mostly of the large
round variety, some being spindle shaped. The
cells have large nuclei, a considerable number
showing double nuclei. The protoplasm is granular
and here and there there is distinct evidence of degeneration. In not a few cells, there is wanted vacuolization of the protoplasm, and, especially in the anterior part of the tumour, the protoplasm is entirely absent from some of the cells, and only the nucleus and cell wall are present.

Although by far the majority of the cells are of the large type, these rest at the site (against which the tumour is pressing) are of much smaller size and are closely packed together.

These cells, which constitute the pigmented portion of the tumour, contain yellowish brown pigment granules similar to that have been described in the foregoing case of melanotic sarcoma.

The intercellular substance is somewhat scanty. In various parts throughout the section large blood spaces and channels are seen, some of them possessing delicate membrane-like linings, others having no wall whatever. Haemorrhages are conspicuous in and near the free surface of the tumour, most of the haemorrhages being of recent occurrence. Posteriorly, the tectoria, though detached, is healthy; but as you pass forward you find that it becomes broken up and focussed upon by subretinal effusion of blood, the
the granular layer being separated from the layer of rods and cones. The degenerated and distorted membrane can be traced forward for a considerable distance, till all evidence of its structure becomes lost.

This tumour, then, has taken its origin from the choroid coat posteriorly. A considerable portion of the choroid has become obliterated. The retina has been detached and owes the most prominent portion of the tumour has been greatly stretched and reduced almost unrecognizable. The growth has occupied a large part of the interior of the globe, but now it has found its way—at least by direct infiltration—to the outside of the globe. A point worth noting, as showing how seldom are lens sarcocoma seen, is the fact that although to the naked eye this tumour seemed free from pigment, sections show small yet distinct areas where the cell contain pigment granules.

These areas, however, constitute such a comparatively small portion of the tumour, that it is quite permissible to call this specimen a fairly typical example of lens sarcoma.
Case VI.

Melanotic Sarcoma of Eyeball and Orbit.

The patient was a man 57 years of age, who noticed about three years previously a dimness in the sight of his right eye. Six months elapsed, at the end of which time his eye was almost quite blind; he called in his doctor who prescribed some medicine for him. A week after he took this medicine his sight improved so that he could count his fingers at a distance of 10 feet, and could distinguish fingers 100 yards away. He then ceased to take his medicine, and in a few weeks his right eye became red and inflamed. He received a lotion for his eye from his medical attendant, the lotion relieving his pain which was very severe, rheumatic in character, and affecting the ear, the nose, and the temples. Ten days later the defect in the vision of the right eye began to get worse, till within a month the eye was totally blind. Since that time at intervals of 2 or 3 weeks he has suffered from pain.

About 3 or 4 months before admission the patient noticed a swelling beneath the lower eyelid nearly as large as a small pea six breadth from above down, and extending horizontally for about 3/4 inch.
He noticed that the swelling appeared of a very dark colour, when he pulled down the lower lid. It then grew pretty rapidly in size, and seemed always to be larger during the attacks of pain and inflammation. Occasionally, he was sick and vomited during these painful attacks.

On admission, a tumour was seen about the size of a marble beneath the lower eyelid. It was uniform in consistence, being fairly hard all over, and firmly attached to the eyeball, with whose movements it coincided. Its edge seemed a little above the margin of the lower eyelid. On turning out the lower eyelid several distinct dark pigment blisters were seen beneath the conjunctival surface. The pupil was immobile, the lens was catalectic, the tension +2, and no perception of light. Diplopia was present.

We burred enucleated the eyeball and thoroughly cleared out the orbit, using the thermosurgery freely in dealing with the latter.

The patient made a good recovery from his operation and was dismissed from hospital apparently cured. He returned six months later, however, when two nodules were found to have appeared, one situated in the floor of the orbit near the
outer canthus, the other in the orbital roof near the inner canthus. Both were firm, hard, and about the size of a pea, and pigmented. They were removed along with a margin of apparently healthy tissue.

No evidence of metastatic growth could be detected in any part of the body.

Pathological Report.

On section the tumour was found to be of firmish consistence and involving both the inner wall of the globe and the surrounding tissues. As the tumour is shown in section on a slide this can readily be seen. The stump of the optic nerve can be seen entering the back of the globe. To one side of it the sclerotic coat is free and healthy looking, but on the other side the retina can be seen to be broken up, its layers being separated from each other by a large resplenia, which is situated partly intracerebrally and partly extracerebrally.

The cornea can be seen anteriorly. An area of what seems to be degenerated tissue is seen just behind the corneal region. The iris...
is dense in life and apparently uninvolved by the new growth. In certain areas the tumour is markedly pigmented, and a few spots of haemorrhage can be made out. On cutting transversely into the tumour, the growth is seen to occupy a larger portion of the interior of the globe, and is of more dense structure. A larger portion of the growth lies to one side than to the other, namely at that side where the neoplasm has penetrated the sclerotic coat. In some of the sections the lens can be detected anteriorly, quite opaque, and shadows of the retina can be made out here and there. These and other points however can be made out better with the low power of the microscope.

If we examine a portion of the tumour such as we find figured on page 76, we find that to the side of the optic nerve on which the Sclera is free and distinct, there is a portion of the new growth inside the globe. It consists of well-marked and deeply stained Sarcoma cells which are of two chief varieties, namely, large round cells and small round cells, the latter...
being scattered about in considerable numbers among the former. There is a little pigment in this part of the tumour of a finely granular nature, and a golden yellow or brown colour. Moreover the pigment is situated almost entirely outside the cell elements, and lying in nearly every case in close proximity to blood vessels or spaces.

Blood vessels are very numerous in this part of the tumour, having vessel walls of considerable thickness, and well formed in every respect, and looking much less fragile than the short vessels in sarcometas generally are. So then: the operatively free side of the optic nerve entrance are found large blood vessels and normal connative tissue. On the other side are just similar blood vessels, squeezed up against the sclerotic by a large mass of sarcometous tissue. This extends quite round the globe on this side between the retina and the oculo-motor muscles, and at the same time a stem to involve the retina itself. It consists of a large quantity of spindle cells, arranged in interlacing bundles running in various directions. A considerable degree of pigmentalisation exists making this part of the tumour rather dark. The pigment granules
are partly intra-cellular, but much of the colouring material lies outside the cells.

High Power. Manifestly the tumour is of a sarcomatous nature, and has split up the sclerotic coat in a remarkable fashion. Anteriorly there is an elliptical area surrounded by fibrous tissue. In this area the sarcoma cells are of a somewhat degenerated nature and are associated with the presence of much pigment and capillary haemorrhage. Outside this area is the sclerotic and as you trace this membrane backwards you find that it is split up in quite a irregular fashion by numerous round and spindly shaped sarcoma cells.

A very interesting and unusual feature in this sarcoma is found in the discovery of some giant cell systems toward the anterior part of the tumour. These systems are most readily seen in a section stained with haematoxylin. So that this tumour consists both of a lymphoid and a melanotic structure, the latter, however, being greatly predominant.

If we examine some sections lower down in the tumour itself, as we have figured on page 77, we find that the tumour is even more deeply
fragmented, and indeed it is in some places, a matter of some difficulty to make out the structure of the tumour on account of the depth of the pigmentation. Sections from the centre of the growth, however, show us that the tumour is invading the choroid coat, and has raised the retina over itself, causing degeneration of that membrane from pressure and interference with its vascular supply. The choroid is practically indistinguishable, being absorbed by the mass of tissue which has arisen from it. The layer to one side of the globe is completely destroyed by the passage of the growth through it.

So that in this case, the tumour has originally been a choroidal pigmentated tumour, which having perforated the sclerotic has become an extrascleral growth and made its appearance at the front of the eye under the lower lid.

The history quite corresponds with the pathological-visual phenomena in every respect and the two taken together form a very typical example of the disease we are seeking to illustrate.

The only peculiar feature is the existence of the few lymphoid cells, but they are so few as not to be of other than minor importance, and
are more of the nature of a curiosity than any
thing else. (Note - Alveolar Sarcomatous of the orbit
is very rare but not unknown. A case is reported
in the British Medical Journal of April 29, 1893
by Mr. Treadwell. The patient received a blow on the
right eye from a bullock's horn; shortly thereafter, a
swelling appeared, which, on removal, proved to be of
the nature of myeloid Sarcoma.)

In concluding this Thesis I must gratefully
acknowledge Mr. George A. Berry's kindness in
allowing me to make use of his cases, and
in giving me the material specimens for microscopic
investigation. I am also indebted to Dr.
J. G. Smith who prepared the sections of the tumours
from case VI for me; and to Mr. J. C. Roderick
who painted the plates from the slides sent in
along with this Thesis.

Reference from page 226.
Mr. Williamson in Brit. Med. Journal 1893,
vol. 33 p. 329 mentions a case of limited
cometoidal - situated Sarcoma which he attempted
to excise. The being found impossible, enucleation
was practised. Sections of the eye showed that
considerable healing had occurred in the corneal wound in the four days intervening between the attempt to incise and the evacuation, and in the stage of the corneal wound were growing some epithelial cells, carried in by the knife at the first operation. This raises the important question as to the possibility of implanting cancerous cells on normal surfaces. This case is of importance studied in connection with those traumatic cysts of the iris considered previously, (see page 5).

April 1896.

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M.B. MRCS