The Course and Prognosis of Orbital Tumors

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INFLUENCED BY SURGICAL OPERATIONS

For Their Removal.

By CHARLES STEDMAN BULL, M.D.,

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[*Reprinted from American Ophthalmological Society Transactions*, 1896.]

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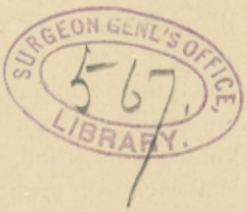

THE COURSE AND PROGNOSIS OF ORBITAL TUMORS AS INFLUENCED BY SURGICAL OPERATIONS FOR THEIR REMOVAL.

By CHARLES STEDMAN BULL, M.D.,

OF NEW YORK.

For some years past my attention has been turned to the prognosis of orbital tumors, whether primary or secondary, as influenced by surgical interference, with special reference to the frequency of return of the tumor and the rapidity of its growth. Such knowledge as I may have gained on the subject, has come almost entirely from my own experience, for ophthalmic literature is well nigh silent on the subject. None of the older authors make any reference to the matter, though all advocate early and radical operative interference. Of the more modern writers on the subject, there are but two who touch upon the question at issue at all, but they speak with no uncertain emphasis. *Michel*, in his Lehrbuch der Augenheilkunde, 2d edition, 1890, says: "The prognosis in these cases is always bad, even after surgical interference. There is great danger of an unfortunate quick return locally of the tumor with

extremely rapid growth. When the tumor proceeds from one or more of the facial bones in the vicinity of the orbit, the bony walls of the latter are certain to be involved, and the growth is correspondingly rapid." *Lawford*, in a paper in the Royal London Ophthalmic Hospital Reports, Vol. XII, in reporting a case of tumor of the orbit, in which five operations were followed by a return of the growth with increasing rapidity, and after the last operation by the rapid death of the patient, says: "An early and radical operation is too frequently followed by a return of the neoplasm and its rapid growth."

In considering briefly the increased rapidity of growth of malignant tumors of the orbit after surgical operations for their removal, it will be convenient to divide these tumors into three classes, viz.: 1st. Tumors which primarily were intraocular, and which have invaded the orbit secondarily. 2d. Tumors which originated in the orbit, whether in the cellular tissue or in the periosteum of its bony walls. 3d. Tumors which originated in the bones or sinuses adjacent to the orbit and involved the latter secondarily.

1st. *Primary intraocular tumors*, which involve the orbit *secondarily*. When an intraocular neoplasm has penetrated the sclera and involved the orbital tissue, or when it has extended backwards along the optic nerve, the prognosis is invariably bad. This condition is sometimes recognized before enucleation of the eye, but more frequently is not discovered until after enucleation has been performed. In such a case there is no certainty that an operation, no matter how radical, will remove all the diseased tissue; and in a very large percentage of cases, the growth returns in the orbit itself, or in some one of the sinuses or spaces adjacent thereto. Even complete exenteration of the orbit and removal of its periosteal lining does not prevent this, once the orbital tissue is involved. Indeed, it has seemed to the writer that the removal of the periosteum from the orbit hastened the return of the growth, by depriving the underlying bone of its protective envelope.

2d. *Tumors which originate in the orbit.* In this second class, primary orbital tumors, malignant in character, in which

the eyeball remains intact or is involved secondarily and late in the course of the disease, the same unfavorable prognosis, as to return and rapidity of growth, must be made. Even when the orbital tumor appears to be encapsulated, experience proves that there is no certainty that some germs have not been left behind. Moreover, malignant growths in the orbit are very rarely encapsulated.

3d. *Extra-orbital tumors, originating in the bones or sinuses adjacent to the orbit, and involving the orbit secondarily.* This third class of cases embraces the most serious and desperate of all. The cavities and bones usually involved are the sphenoid and ethnoid. The nature and origin of these growths may often be diagnosticated in the beginning, as soon as orbital symptoms arise, and sometimes even before any such symptoms present themselves. The prognosis in these cases must be put down as absolutely bad from the beginning. No matter where the origin of the growth, all the deep bones of the face and their communicating sinuses eventually become involved. By emptying the sinuses and extensive exsection of the bones diseased, we do not succeed in arresting the progress of the malady, and experience has taught the writer that every operation in these cases tends to increase the certainty of return and the rapidity of its growth, and in so far shortens the life of the patient. Each operation, being of necessity the more extensive and severe, saps the strength of the patient and weakens his powers of resistance.

The tendency of these malignant tumors of the orbit, whether primary or secondary, is to grow forwards or outwards, rather than inwards or backwards, and this fact probably explains why patients afflicted with such tumors live as long as they do, and why they usually die from general exhaustion, rather than from extension of the growth to the brain. It is the exception when these tumors cause death by extension to the brain, whether through the roof of the orbit, or through the optic foramen, or through the sinuses at the apex of the orbit.

The tendency to extension outwards and forwards of these tumors may perhaps also explain the increased rapidity of their

growth after exenteration of the orbit, or after the more radical operation of exsection of the diseased bones. The empty orbit, or the cavity left in the face by the removal of the diseased bones, are free spaces towards which there is no resistance to the extension of the neoplasm, while backwards or upwards its progress is hindered by a bony wall of varying thickness, in which absorption goes on slowly, even when the periosteum has been removed.

These brief remarks and the conclusions which follow are based upon the histories of thirty-six cases, all taken from the private practice of the writer, as it has been proved that patients in private practice can be more satisfactorily followed up than those in hospital practice. All these cases have been watched from start to finish by the writer, and the course of the disease and the results of operative interference may be read in detail in the accompanying histories of the cases. In a much larger experience, extending over a period of twenty-five years of hospital service, the same conclusions have been forced upon the writer.

Conclusions —

1st. The prognosis of all forms of malignant orbital tumors, whether primary or secondary, is unfavorable ; and if the tumor be primarily one of the deep facial bones or their sinuses the prognosis is positively bad.

2d. Except in the case of encapsulated tumors of the orbit, surgical interference is almost invariably followed by a return of the tumor, and the growth of the secondary tumor is more rapid than that of the primary lesion. With each succeeding operation, the period of quiescence in the return of the tumor grows shorter, and the rapidity of the growth increases.

3d. The patient's family, and in certain cases the patient himself, should in the beginning be told of the serious nature of the trouble, and be warned that complete removal of all the diseased germs is a well nigh hopeless task. The burden of the decision as to surgical interference must rest upon the shoulders of the patient.

4th. Repeated operations in these cases undoubtedly

shorten the life of the patient. While it is therefore our duty to operate in all cases, in order to relieve severe or unbearable pain, we should be slow to operate merely for the sake of relieving temporarily physical disfigurement or deformity, especially if we are convinced that by so doing we shorten the life of the patient, even if that shortened life is rendered more bearable to the patient.

CASES.

CASE I. A gentleman, aged 63, first seen Nov. 1, 1873, vision of the left eye had been failing for nearly a year, and the eye was now blind. Cornea clear, no anterior chamber. Iris discolored. Lens opaque, T.+1. Constant dull ache. Diagnosis of intraocular tumor. Eyeball enucleated, and it was then seen that growth had involved the optic nerve, and had also perforated sclera just back of equator in infero-nasal quadrant and extended into orbit. Complete exenteration of orbit done, and large piece of optic nerve exsected. Growth returned in six weeks at apex of orbit, and grew rapidly. Second operation done two months after first, and periosteum of orbital walls removed as far as practicable. Return of growth at apex of orbit in less than two months, and within one month entirely filled orbit and began to appear in nose. Four months after second operation, the orbit was again emptied of the mass, the nose entirely cleaned out, including the turbinated bones, the floor of orbit removed, and the maxillary sinus emptied of a mass of gelatinous, vascularized tissue. The patient did not rally from this operation very rapidly, and before he had left his bed the growth could be seen projecting from the sphenoidal fissure. He declined all further interference, and lived for nearly six months with scarcely any suffering, and died of general exhaustion.

CASE II. A man, aged 57, first seen April 3, 1874. There was an epithelioma of the inner half of the left lower lid and the inner canthus. The growth had involved the conjunctiva and extended for some distance beneath the skin in all directions. The diseased parts were carefully excised, the line of incision being made through healthy tissue. The whole thickness of the lid,

including the conjunctiva, was cut away down to the fornix. After the bleeding had ceased the parts were carefully examined, and the orbital tissue seemed to be uninvolved. The empty space was then filled by taking a flap from the forehead, twisting it on its base in the usual way, and uniting the flap to the sound parts by necessary sutures. The wound healed without suppuration and with very little deformity. Four months later the patient appeared, complaining of a lump at the inner corner of the left orbit, which proved, on examination, to be a subconjunctival orbital tumor, which hugged the inner wall of the orbit. He was advised to have the entire contents of the orbit, including the eyeball, removed at once by a radical operation, in spite of the excellent vision still present, and to this he consented. Complete exenteration of the orbit was done, and though a most careful examination of the empty cavity showed an apparently healthy periosteum, the latter was also removed entire from the orbital margin to the apex of the orbit, and the cavity stuffed with iodoform gauze. Two months later the growth reappeared at the infero-nasal angle of the orbit, far back, and grew so rapidly that in less than four weeks the orbit was entirely filled. This was again removed, the ethmoid opened and found filled with the growth, and the bone was removed in sections through the orbit. The nasal cavity was opened into through the infundibulum, and free drainage established. In less than a month a nodule appeared in the inner end of the upper lid and grew rapidly in size, and early showed a tendency to extend upon the forehead and over the bridge of the nose. The position of the return of the growth rendered necessary an extensive plastic operation for its removal, and this the patient declined to have done. Two months after the last operation the growth appeared in the cavity occupied by the ethmoid, and grew very rapidly. The patient refused to have anything further done, and lived for nearly two months longer in great suffering before death relieved him.

CASE III. Boy, aged 2½ years, first seen June 5, 1874. All the signs of intraocular glioma in the right eye, the left eye being sound. Immediate enucleation showed that the tumor had

perforated the sclera posteriorly close to the entrance of the optic nerve, and had extended into the orbit. The optic nerve looked healthy. The contents of the orbit were removed down to the periosteum, and the optic nerve was drawn forward and a considerable piece exsected. Nothing abnormal was noted in the orbit for nearly two months, and then a suspicious infiltration appeared in the vicinity of the optic foramen. This was immediately cauterized, but in spite of this grew rapidly, and within five weeks had completely filled the orbit. The child's general condition was bad, but a second exenteration of the orbit was done, and the entire periosteum was removed. This second operation was followed in less than a month by the reappearance of growth in the sphenoidal fissure. The child's general condition was so bad that no further operative interference was justifiable, but the location of the second return of the growth showed that the deep cavities of the bones at the base of the skull were involved. The tendency of this growth was forward and outwards, and, though the child lived for five months longer, there were no head symptoms until three days before his death, which occurred in profound coma.

CASE IV. A lady, aged 35, first seen June 15, 1874. Vision began to fail in the left eye three years before, and this eye had been entirely blind for three weeks. There was a yellowish reflection from the pupil, which was seen to be a highly vascularized new growth. Enucleation was advised, and was done two days later. At the operation it was found that the tumor had perforated the sclera at one point in the post-equatorial supero-nasal quadrant, and entered the orbit. Radical exenteration of the orbit was immediately performed, but the periosteum seemed healthy and was not disturbed. For four months nothing abnormal was observed, and then the growth appeared on the floor of the orbit far back. At the second operation the periosteum was stripped from the orbit, and the bony surface carefully cauterized. This was followed by slight suppuration, which soon ceased. Three months later the growth appeared at the junction of the inner wall and floor of the orbit, and was immediately removed and the bone again cauterized. Almost

before the resulting suppuration had ceased, a suspicious appearance was noticed in the sphenoidal fissure, and a few days later the growth was discovered far up in the nose. The growth was so rapid that the orbit became filled in less than a month, and two months from the time at which it was discovered in the upper nasal meatus, it had filled the nose, and could be seen from the nostrils. The patient declined any radical operation which would necessitate the removal of the facial bones, but consented to the clearing out of the orbit and nose. In the course of this operation the maxillary antrum was found involved, and a large mass was removed from its interior. The patient lived for nearly six months longer, and died of exhaustion. All the cavities of the bones of the face and skull were filled before death.

CASE V. Gentleman, aged 40, first seen July 27, 1874. Three years before a small pimple had appeared at the outer angle of the right lower lid, and had slowly increased, until when I saw him it had involved nearly the whole of the lower lid and had extended into the orbit. The eye was uninvolved and vision was normal. The whole lower lid and cul-de-sac were excised, and as much of the contents of the orbit as seemed involved were removed. The gap was filled by sliding the cheek and temple upward and inwards in the usual manner. The result was excellent, except for the absence of the lower cul-de-sac and some limitation of mobility of the eyeball. For five months the patient's condition was satisfactory, and then the growth returned in the floor of the orbit near the outer margin, and rapidly involved the ocular conjunctiva. He was advised to have the eyeball and entire contents of the orbit removed, and this was done. Extensive disease of the orbital tissue was found along the floor and outer wall, and the periosteum of the orbit was stripped off as far as the apex and excised. After the bleeding had ceased, the whole orbit was cauterized and loosely stuffed with iodoform gauze. The resulting suppuration was slight in amount. Within six weeks after the second operation, the growth returned on the outer wall of the orbit, and it was at once removed and the bone cauterized. For two months there was no return of the tumor, and then a suspicious growth was seen protruding from the sphenoidal fissure, and it was also felt in

the upper part of the nose. The patient declined all further interference, but he lived for more than a year after the last operation, and finally died of exhaustion. The growth had then filled the orbit, nose, maxilliary antrum, and extended out upon the cheek and temple.

CASE VI. Gentleman, aged 42, first seen August 26, 1874. Vision had begun to fail in the right eye in November, 1873, and when I saw him he could only see when looking directly downwards. There was detachment of the retina downwards, increased tension and infiltration of the orbital tissue on the nasal side. A tumor was diagnosticated, and he was advised to have the contents of the orbit removed. This was done three days later and extensive infiltration of the orbital tissue found, together with a choroidal sarcoma, melanotic in character, which had perforated the sclera in the region of one of the vasa vorticosa, and was continuous with the growth in the orbit. This necessitated the removal of the periosteum and subsequent cauterization of the bone. No growth of the tissue was found in any of the communicating cavities. Six weeks later, however, the growth was discovered in the sphenoidal fissure, and grew very rapidly. It soon appeared in the nose, and interfered so much with his breathing that he consented to a second operation. This consisted in the removal of the growth in the orbit and in the complete clearing out of the nostrils. Seven weeks later the growth was again removed from the naso-pharynx, for the relief of constant pain and to improve the breathing. Two months later a third operation was done, consisting in excision of the superior maxilla, and removal of portions of the ethmoid and sphenoid bones. Four months later he died semi-comatose, with symptoms of an extension of the growth into the cranial cavity.

CASE VII. Boy, aged 4, first seen January 31, 1876. Five months ago a swelling was noticed at the external canthus of right eye, just beneath the superior orbital margin. It had reached the size of a Lima bean, and was attached to the roof and external wall of the orbit. The eye was displaced downwards and inwards, and there was extensive infiltration of the orbit. The boy's parents were both tuberculous, and it was

thought, therefore, that the disease in the orbit might be of the same nature. An attempt was made to remove the growth and the diseased orbital tissue, leaving the eye *in situ*, but this proved to be impossible, and the eyeball was enucleated, though apparently sound, and then the exenteration of the orbit was completed. The child did well for nearly seven months and then an infiltration appeared at the apex of the orbit and grew so rapidly as to simulate fungus hæmatodes. The patient's general condition, which up to that time had been very satisfactory, also became markedly worse, so that another operation was deemed unwise. The child became rapidly emaciated, obstinate diarrhœa ensued, and death took place less than ten months after the first and only operation.

CASE VIII. Boy, aged 5, first seen April 26, 1877. Six months before a small subconjunctival growth was noticed at the lower and outer angle of the left orbit, which had steadily increased in size. It was pigmented, and the conjunctiva was movable over it. The mobility of the eye was unimpaired. There was marked malformation of the left ear, the lobe of the ear being detached from the concha, and the external auditory canal was entirely absent. The orbit gradually filled and the eye was displaced forwards, inwards, and downwards. Four weeks after I saw him an ulcer formed on the left cornea, and soon perforated, causing a large prolapse of the iris. The parents then consented to an operation, which they had hitherto declined, and the entire contents of the orbit, including the eyeball, were removed. The original growth was found firmly adherent to the periosteum of the outer wall, and the entire orbital tissue was infiltrated. The periosteum was also removed, though it appeared healthy. The child's condition was fairly good, and the case did well for five weeks, and then the growth returned on the floor of the orbit, near the margin. It was at once removed, and the bone cauterized. In three weeks it returned in another spot on the outer wall. This was also removed and the bone cauterized. In three weeks the growth reappeared in three different places on floor and inner wall of orbit, and on the malar prominence outside. Removal of all the diseased bones was then advised, but declined by the par-

ents. The child lived for nearly four months longer, and died of exhaustion without any head symptoms, about seven months after the first operation.

CASE IX. A gentleman, aged 23, first seen May 2, 1878. Eight months before a small tumor had been noticed at the outer angle of the right orbit. This had grown very rapidly in size, until it filled the entire orbit and extended upwards upon the frontal bone and outwards upon the temple. The eyeball was displaced downwards and inwards, and was entirely blind from atrophy of the optic nerve. The patient was told of the desperate nature of the case, and consented to an operation. The entire contents of the orbit were removed, the skin was stripped back from the forehead and temple, and all the diseased tissue was removed. The periosteum was then removed from the frontal, temporal, and malar bones as far as could be reached, and also from the interior of the orbit, and the bones cauterized. No communication was found between the growth and the frontal or maxillary sinuses. An examination of the orbit showed that the tumor had already extended into the sphenoidal sinus and cavity of the ethmoid, as the bone was perforated in several places. The os planum was removed and the contents of the ethmoid cells were emptied, and as much of the growth as possible was excised from the various fissures and sinuses. The patient was subsequently told that all the bones of the base of the skull were diseased, and that the growth would continue to increase, and probably with rapidity. In less than four weeks from the date of the operation it appeared in the nose, filled the ethmoid and began to protrude into the orbital cavity. The patient declined any further interference, and I could not urge it. He lived for about fourteen months and eventually died of some abdominal complication, the nature of which I never ascertained.

CASE X. A gentleman, aged 74, first seen May 23, 1879. For more than a year there had been a growth on the right eye, which began at the inner canthus, and extended forwards until it partially covered the cornea. When I saw him the growth had extended into the orbit. It was warty in appearance and very vascular. The right eye was partially blind

from cataract, and, as the disease had involved the orbit, I advised an immediate enucleation and removal of the contents of the orbit. This was immediately done, and the whole orbital tissue found diseased. The optic nerve looked healthy, but a piece was excised. The case was watched very carefully, but nothing suspicious was noticed for nearly three months, when a hard nodule was discovered at the apex of orbit. This grew very slowly for nearly two months, when it suddenly grew softer and then spread with extreme rapidity. The patient then consented to a second operation, which was made as radical as the nature of the case would admit. Three weeks from the second operation the growth again appeared at the apex of the orbit, increased very rapidly, the patient's condition became alarming, and he died suddenly five weeks after the second operation.

CASE XI. A lady, aged 26, first seen July 7, 1879. There had been failure of vision in the left eye for more than two years and the eye had been blind for about five months, probably from tumor of the choroid and detachment of the retina. It was now very painful from iridochoroiditis, and I advised its removal. Enucleation revealed the fact that the optic nerve was involved in the disease and that the sclera had been perforated close to the entrance of the optic nerve. The entire contents of the orbit were removed, the optic nerve pulled forward, and as large a piece as possible was exsected, and the periosteum was stripped from the bones all round as far as the apex and removed. For about three months there was no return of the growth, but early in October it made its appearance at the apex, and by the end of the month the growth had entirely filled the orbit and protruded between the lids. The orbit was again cleaned out, but all the sinuses were found to be involved. The os planum of the ethmoid was removed, and the floor of the orbit also, and the contents of the ethmoid, sphenoid, and maxillary sinuses cleaned out.

By *December 3d* a small nodule appeared in the upper lid near its center and was immediately removed. The growth did not return until *March 8th*, when a large nodule was found at the inner end of the upper lid which extended into the nose and also into the lower lid, and another mass was found at the apex of the orbit.

On *March* 19, 1880, both lids were removed, together with the superior maxilla, roof of the orbit, most of the ethmoid, and part of the palate bone. The operation was a prolonged one, but she rallied well and for two weeks did very well. A change for the worse set in, she became very weak and died, apparently of exhaustion, about four weeks after the operation.

CASE XII. A gentleman, aged 22, first seen December 15, 1879. There had been convergent squint in the left eye from infancy. For the last four months there had been ptosis of the left upper lid and exophthalmos. There was a growth involving the floor, outer wall, and roof of the orbit. Immediate operation was advised and declined.

On *February* 18, 1880, all the symptoms were much increased, and the entire contents of the orbit, including the periosteum, were removed, and the bones thoroughly cauterized.

By *April 5th* the orbit was again filled by the growth, and was again emptied and the ethmoid bone, from which the tumor seemed to come, was removed in pieces.

On *June 25th* the growth returned in the orbit and on the malar prominence and was again removed, together with portions of neighboring bones.

On *July 30th* a fourth operation was done and a large mass removed from the orbit and maxillary antrum.

By *September* 7, 1880, the growth had again filled the orbit and maxillary antrum, and protruded into the posterior nares. The superior maxilla was exsected, and the palate bone, part of the body and wing of the sphenoid, and the inferior and middle turbinated bones were removed. The soft parts healed rapidly, with scarcely any suppuration, and nothing suspicious was observed until five months later, when a mass appeared at the bottom of what had been the orbit, and grew very rapidly in size. No further operative interference was deemed justifiable. The patient lived for about eight months without suffering much pain and died, apparently of general exhaustion.

CASE XIII. A gentleman, aged 38, first seen January 12, 1880. The patient had had difficulty in breathing for about five years, and it was supposed that it was due to a tumor of the upper nares. About a year before the right eye began to pro-

trude, and about six months ago the exophthalmos began in the left eye. There had been failing vision for a year in both eyes. An examination showed that both anterior and posterior nares were filled by a growth which extended into both orbits, and into the right maxillary antrum, and probably sprang from the body of the sphenoid. There was complete atrophy of the right optic nerve and partial atrophy of the left optic nerve. He was urgent for an operation, in spite of the very unfavorable prognosis given, and consented to the enucleation of the right eye, which was blind. The right eye was enucleated. The floor of the right orbit was found defective posteriorly, and both antrum and orbital cavity and ethmoid filled with the growth. These cavities were entirely emptied of the tumor, and as much of the ethmoid bone as possible was removed. The turbinated bones were then excised, and the entire mass removed from the nose, in the process of which a free opening was made into the cavity of the ethmoid. The tumor also protruded into the left orbit, but could not be reached from the right side. The cavities were then thoroughly washed out and loosely packed with gauze. One result of the operation was an evident diminution in the degree of exophthalmos on the left side. In just two months the growth appeared in the right orbit from the ethmoid cavity and then increased rapidly in size. No further operation was attempted, and the patient died nine months after operation.

CASE XIV. A gentleman, aged 42, first seen September 13, 1880. There was a sarcoma of the choroid in the left eye, with detachment of the lower half of the retina. The eye was enucleated immediately, but it was found that the tumor had perforated the sclera in the infero-nasal quadrant, near the nerve entrance, and had extended into the orbit. Four operations were performed on this patient within a period of fourteen months, all of the most radical character, and the ethmoid, superior maxilla, palate, turbinated, and part of the sphenoid bones, were removed. The second operation was done four months after the first; the third was done three months after the second; and the fourth was done two months after the third. The patient lived only three months after the last

operation, and by that time the tumor had filled the orbit and nose and appeared on the face.

CASE XV. A gentleman, aged 46, first seen October 18, 1880. At that time there was a large epithelioma of the left lower lid at the inner canthus, which involved nearly one-half of the lid and had extended into the orbit. The diseased portion of lid was removed and as much of the orbital tissue as possible, but the patient would not consent to the enucleation of the eye, though told of the necessity for it. The gap was covered by a flap brought from the forehead, and the wound healed promptly. For three months there was no return of the growth, and then it appeared simultaneously in the orbit and at the apex of the flap. This patient was in vigorous health, and four more operations were done, the last one eighteen months after the first one. This was the most radical of all, as all the bones of the face and skull on that side were involved in the growth. This case was remarkable in that the growth returned within two weeks after the fifth and last operation, and the patient lived only two months after its final reappearance.

CASE XVI. A lady, aged 35, first seen December 6, 1880. There was a tumor of the left iris, ciliary body, and choroid, presumably sarcomatous, which had been growing for nearly three years. The eye was at once enucleated and carefully examined, but no signs of perforation were found, and the orbital tissue looked healthy. A microscopical examination showed that the tumor was a diffuse sarcomatous infiltration of the whole eyeball, all the tissues, save the lens and cornea, being involved in the process. The sclera was infiltrated by the sarcoma cells in many places, and I therefore gave an unfavorable prognosis as to the case. She was watched carefully, but nothing suspicious was observed in the orbit for seven months, and then a nodule was discovered far back, near the apex. This was removed at once and with the greatest ease, there being no adhesions, and the entire contents of the orbit carefully dissected out. An examination of the nodule showed it to contain muscular fibres infiltrated with small round cells. Within three months the growth returned in the orbit, apparently from the sphenoidal fissure, and all within reach was at once removed.

Within one month the tumor again grew from the sphenoidal fissure and increased rapidly in size. The patient became emaciated; developed a low fever, and sank steadily, and death occurred just five months after the last operation.

CASE XVII. A lady, aged 35, first seen December 16, 1880. The right eye had been gradually failing in vision for more than a year. There was a small tumor in the infero-nasal quadrant of iris, directly continuous with a tumor of the ciliary body, and detachment of the retina, downwards. The eye was enucleated and immediately bisected. The intraocular tumor was found to involve the choroid as far back as the optic nerve, and the nerve was diseased. This necessitated the immediate exenteration of the entire contents of the orbit, including the periosteum, which was done at once, and the bones were then cauterized. Nothing suspicious was observed in the orbit for four months, and then a peculiar swelling of the inner wall was noticed, which increased steadily, but not very rapidly, for two weeks, when its nature became unmistakable. The second operation consisted in the removal of the inner wall of the orbit, and as much of the internal structure of the ethmoid as could be reached. The latter was a gelatinous gray mass which contained a mass of small cells in a myxomatous matrix. The return of the disease in the ethmoid cavity was very rapid after this second operation, so that in five weeks the orbit was nearly filled. A third operation for the removal of the orbital contents showed that the growth had invaded the sphenoid bone and upper cavities of the nose. The patient declined any further surgical interference, and died in about eight months, with head symptoms pointing to an extension of the tumor to the intracranial cavity. The growth filled the orbit and nose, protruded into the pharynx, and had extended from the orbit, downwards upon the cheek, and outwards upon the temple.

CASE XVIII. A lady, aged 45, first seen August 1, 1881. There was a growth of the ocular conjunctiva of the left eye, on the temporal side near the corneal margin, which was as large as a bean, and had been growing for two months. It was carefully excised, and the sclera cauterized. The growth returned early in October, and by November 21st it involved the upper, outer,

and lower quadrants of the eyeball and covered the temporal third of the cornea. It extended back of the equator, and the eye was displaced inwards. The entire contents of the orbit, including the eyeball, were immediately removed. For five months there was no return of the growth ; but, early in May, a small nodule was discovered on the inner wall of the orbit, and, by June 7, 1882, the tumor filled the entire orbit. The contents of the orbit were again evacuated, and the periosteum stripped from the bones and removed as far as the apex. A careful examination of the bones and sinuses showed no demonstrable trace of the disease. In six weeks the growth returned on the floor of the orbit far back, and on being removed, it was seen that it also protruded from the sphenoidal fissure. After the third operation, the growth of the tumor was very rapid, not only outward into the orbit, but inwards into the ethmoid cells, and downwards into the nose. The patient refused all further operation, and lingered in much suffering for seven months, when death ensued.

CASE XIX. A gentleman, aged 35, first seen January 20, 1883. Health perfect. No rheumatism or syphilis. Left eye began to protrude fourteen months ago and exophthalmos has slowly increased. Now eye is pushed downwards and outwards as well as forwards, diplopia. Media, fundus, and vision normal. Palpation shows a soft, immovable but resilient tumor on inner wall of orbit. Right eye normal. It was thought the tumor might be encapsulated and an incision was made through the upper lid, just below the superior orbital margin, about an inch and a half long. The tumor was at once revealed and proved to be a soft semi-gelatinous mass, which had proceeded from the ethmoid cells and had caused complete erosion of the inner wall of the orbit. All attempts to save the eye were at once abandoned ; the globe and entire contents of the orbit were at once removed and the ethmoidal growth cleaned out. A further examination showed that the tumor had extended into the nose, and in all probability originated in the sphenoidal sinus. After the patient had recovered consciousness from the ether, he was told the serious nature of the trouble and that all the deep bones and sinuses were involved. He declined any more radi-

cal operation at the time. Two months later the same operation was repeated, the orbit, ethmoid, and nose being entirely cleaned out. The bleeding from this operation was profuse, and the patient was much prostrated before it could be checked. Within a month the tumor reappeared in the ethmoid, but the patient would not submit to any further operation. He lived for eleven months after this, but long before his death the growth filled the nose and he was obliged to breathe through the mouth. The disease also invaded the right orbit.

CASE XX. A young girl, aged 9, first seen December 11, 1883. Two years ago the right eye began to protrude, at first forwards and then downwards, and the exophthalmos has steadily increased. The vision, field of vision, and fundus were normal, and the media were clear. Nothing was found in the naso-pharynx or maxillary sinus. Subconjunctival veins in the cul-de-sac enormously engorged. The eyeball can be pressed back into place but at once resumes its abnormal position when the pressure is relaxed. Palpation of the orbit revealed nothing. The parents were told that it was a tumor of the orbit, possibly of the optic nerve, and that an attempt might be made to remove the tumor and save the eye, though the sight would be destroyed. To this they consented and the operation was done in the usual manner. The tumor was found at the apex of the orbit, entirely surrounding the optic nerve, and was apparently encapsulated. Subsequent examination showed it to be a sarcoma of the orbital tissue which had grown in the intra-muscular funnel around the optic nerve, but the nerve itself was not involved in the disease. The patient did not rally well from the operation and remained much prostrated for nearly five weeks. The cornea became cloudy but did not ulcerate. Towards the end of the third month after the operation, the eye began again to protrude and the orbital tissue was found infiltrated on the floor and inner wall of the orbit. Six months after the first operation the eyeball was enucleated and the entire contents of the orbit evacuated. The child never recovered from this operation and died from exhaustion at the end of the second week.

CASE XXI. A gentleman, aged 41, first seen February 25, 1884. There was protrusion of the right eye downwards and

forwards, but no limitation of motility. Vision had begun to fail two weeks before and was reduced to 20/100. A growth could be felt on the inner wall of the orbit, far back. This patient had suffered severely from constitutional syphilis. The eye was enucleated and entire contents of orbit were removed. The tumor was not encapsulated. Periosteum appeared smooth and healthy. Return of the growth on the inner wall of the orbit far back within three months. This was removed five months after the first operation, and it had then involved the floor and inner wall of the orbit, the apex and sphenoidal fissure, and there was erosion of the os planum of the ethmoid. The periosteum was then stripped up and removed and the bones cauterized. This operation seemed to hasten the return of the tumor in the orbit, as it grew with great rapidity from the sphenoidal sinus. One month after the second operation the growth was again removed from the orbit and the ethmoid was then found to be involved. Two more operations were done at intervals of two months, the growth being on each occasion removed from the orbit and ethmoid cavity. After the fifth operation the patient declined to have anything further done, but lived for more than a year before he succumbed to general exhaustion.

CASE XXII. A lady, aged 46, first seen February 8, 1884. Right eye began to protrude about two years ago and vision has gradually failed. The exophthalmos is forwards, inwards, and downwards. Constant pain in orbit and head. Media clear, V=0. Tumor can be felt on external wall and floor of orbit. Eyeball immovable outwards and downwards. The eye was enucleated and the entire contents of the orbit removed. Orbital tissue generally infiltrated by the growth, which also extended backwards through the optic foramen, and into the sphenoidal fissure. Ethmoid apparently uninvolved. Return of the growth from both sphenoidal fissure and optic foramen within five weeks after the operation, and as much as could be reached at once removed. Headaches became more severe, and the growth soon appeared in the upper nose. Orbit remained free for two months and then began to fill rapidly again from the apex. This was again removed, and a large mass was also

removed from the nose. The patient was not seen again until four months had elapsed, and then the orbit was again full and the ethmoid was found involved, with loss of part of the inner wall of the orbit. As the growth had increased in a forward direction, its extension backwards had apparently stopped, for the headaches had nearly ceased. The patient had grown very weak and emaciated and was in no condition for any further operation. She died four months later.

CASE XXIII. A little girl, aged 2½, first seen October 6, 1884. There was a small, hard, circumscribed tumor of the orbit at the upper and inner angle, which pushed the upper lid forward, and had been noticed for a year. This was removed through an incision made in the lid just beneath the orbital arch. It was firmly adherent to the ethmoid, and proved to be encapsulated. It was dense, smooth, and resistant. The trochlea was divided in the operation. The tumor seemed to be mainly connective tissue with very few cells. There was no return of any trouble for four years, when a lump was observed in the same location, which grew slowly in size for six months. Its growth then became more rapid, pushed the eye downwards, forwards, and outwards, and protruded beneath the lid. An examination showed extensive infiltration of the orbit, and the eye and entire contents of the orbit were removed. The inner wall of the orbit was partially eroded, and a large opening into the ethmoid cavity showed the growth protruding. It was soft, myoxatous in character, but not very vascular. The ethmoid cavity was emptied and thoroughly washed out, and the orbit treated as usual. In less than two months the growth appeared again in the ethmoid and orbit, grew with great rapidity; the child fell off rapidly in health, became cachectic, and died in a little less than four months, of what looked like general marasmus.

CASE XXIV. A gentleman, aged 52, first seen November 13, 1884. This patient had been twice operated on for epithelioma of the lower lid on the left side. When I saw him there was a tumor on the floor of the orbit, which extended the entire length of the orbital margin, and the flap of skin which formed the lower lid was infiltrated. The eye was pushed upwards and

outwards, and was blind. The patient insisted on an operation, though told that it would probably hasten the growth of the disease, as it could not be eradicated. The eye was enucleated, the contents of the orbit, densely infiltrated, were removed and all the infiltrated part of the lower lid cut away, and the place filled by sliding the cheek upwards. I did not see the patient for four months, and then the growth had filled the orbit, extended over upon the cheek as far as the middle of the superior maxilla and outwards into the zygomatic fossa. There were also some symptoms of a growth in the maxillary antrum. He was suffering great pain, and consented to removal of the growth from the orbit and from the external surface of the malar and maxillary bones, but declined to go any further. This operation showed that the tissues and skin of the face were involved as well as the bones. Subsequent to this operation the disease extended very rapidly upon the face and jaw, and involved, before the patient's death, the temple and auricle. He died three months after the second operation, which was the fourth operation in all.

CASE XXV. A gentleman, aged 50, first seen December 9, 1884. The right eye had been blind for nearly a year, and contained a large choroidal tumor, which had been suspected before from the general symptoms. There were no signs of perforation of the sclera, and the orbital tissue looked healthy, but, on opening the eyeball, the head of the nerve was found to be involved in the growth. The entire contents of the orbit were therefore removed, and as much of the optic nerve as possible exsected. Orbit remained apparently healthy for fourteen weeks, and then a small gray nodule made its appearance at the apex. This was at once removed and the apex cauterized. In three weeks another nodule appeared on the nasal side of the previous one, and was removed on the third day after its appearance, and the bone again cauterized. At this time nothing was observed in any of the sinuses. For nearly two months nothing abnormal was noted, and then three small nodules appeared, one at the apex, and two on the inner wall of the orbit, and grew with great rapidity. The patient's general condition was so bad that it was decided to postpone the operation. The

fourth operation was done six weeks after the appearance of the three nodules, and at this time the orbit was filled, and the growth protruded from the sphenoidal fissure. After the whole mass had been evacuated from the orbit, the inner wall of the orbit was found to bulge towards the orbit, and it was suspected that the ethmoid cells were involved in the disease, which proved to be correct. The general health of the patient was so enfeebled that no more operations could be thought of. He died four months later, apparently of general exhaustion.

CASE XXVI. A lady, aged 21, first seen January 12, 1885. There was a small tumor under the left lower lid, along the orbital margin, which pushed the lid forwards, and could be traced along the floor and inner wall of the orbit as far back as the finger could reach. It had been growing for about three years. By January 26th it had covered the entire floor of the orbit and extended up on the inner wall over the edge of the orbit, and down on the superior maxilla. The eye was displaced upwards and outwards. The maxillary antrum seemed uninvolved, and nothing could positively be made out in the upper nasal cavity. She had seen numerous surgeons, but was never willing to submit to any operation. The eye was nearly blind, and she consented to its removal. After this was done, it was found that the tumor was more extensive than had been supposed. It covered the floor, inner wall, and apex of the orbit, filled the ethmoid cells, the os planum being in places eroded, and involved all the fissures at the rear of the orbit, and also the superior nasal meatus. The hopelessness of the case was at once apparent. The tumor probably originated in the body of the sphenoid, and extended in every direction except backwards. The orbit, ethmoid, and superior nasal cavity were thoroughly evacuated, and as much of the tumor in the sinuses as could be reached from the orbit was removed. The orbit was loosely stuffed with iodoform gauze, and drainage established through the nose. The dressings were not removed for two days, and the cavities then looked healthy. No radical removal of diseased bone tissue was permitted by the family, on being told of the hopelessness of the case. The tumor returned first in the ethmoid five weeks after the first operation, and within six

weeks had nearly filled the orbit and upper nose. In all, four operations were done, at intervals of eleven, nine, and fourteen weeks. The patient died, seven months after the last operation.

CASE XXVII. A gentleman, aged 70, first seen Oct. 26, 1885. There was a tumor of the ocular conjunctiva of the right eye, on the nasal side, which had extended into the orbit. The primary growth was a conjunctival carcinoma, and had been removed eight months before I saw him. The eye was blind from cataract. I therefore enucleated it, and then removed the entire contents of the orbit. In six weeks the growth returned at the inferior margin of the orbit, apparently in the periosteum, but the lower lid was not involved. It was at once removed, the periosteum stripped off from the floor of the orbit, and the bone cauterized. Three months later a nodule appeared at the inner end of the lower lid. The inner third of the lid was excised, and the cheek was slid upwards and inwards to cover the defect. In less than two months the growth reappeared on the edge of the orbit and in the tissue of the cheek which formed the lid. Owing to the age of the patient I declined any further operative interference. The infiltration in the lid increased slowly, but that in the orbit grew very rapidly in all directions, and within two months had extended into the maxillary sinus and ethmoid. The patient, however, lived for a year before succumbing to the disease.

CASE XXVIII. A lady, aged 20, first seen Nov. 16, 1885. During early childhood a small tumor appeared at the inner angle of the left upper lid, which was hard and freely movable at first. It remained about the size of a large pea until three months before I saw her, since which time it had grown rapidly in size. It was firmly attached to the roof and inner wall of the orbit, pushed the upper lid forwards, and the eye downwards and outwards. I removed the tumor through a curved incision in the upper lid, following the line of the orbital margin. It was firmly adherent to the bone and seemed to be encapsulated. The cavity around it seemed smooth and healthy. Wound healed readily and eye resumed its normal position. The tumor proved to be a fibro-sarcoma, and though apparently

encapsulated, I gave a bad prognosis. The patient did well for a year, being under occasional observation. At the end of that period an infiltration of the orbital tissue appeared on the inner wall of the orbit, which rather rapidly extended to the floor, and caused exophthalmos. The eye was normal, but it was deemed impossible to remove the tumor without enucleation of the eyeball, and this was at once done. The growth was found to extend far back along floor and inner wall of orbit, and the whole orbital contents were removed and the periosteum stripped up and excised. Growth returned in four months on inner wall and apex of orbit, and grew very rapidly. Was again removed, and in less than two months appeared at the apex of orbit and in sphenoidal fissure. Patient became rapidly marasmic and emaciated. A fourth operation was done, and the orbit emptied, but patient died three weeks after the last operation.

CASE XXIX. A lady, aged 46, first seen Nov. 22, 1886. At that time there was an epithelioma which involved the inner half of the right upper lid, but seemed to be confined to the lid margin and skin surface. It was removed by a free incision through apparently healthy tissue, and the vacancy filled by sliding the cheek upwards and inwards, the operation being facilitated by a horizontal incision at the external canthus, and a vertical incision down along the side of the nose. The flap healed rapidly, and nothing suspicious was noted for fourteen months. Then a nodule appeared on the floor of the orbit near the margin, and was at once removed. For four months there was no return, and then appeared a general infiltration of the orbital tissue on the floor of the orbit. The eye was normal, but it was deemed necessary to sacrifice the eye in order to get at the disease, and to this the patient consented. The entire contents of the orbit were removed, including the periosteum, and the sinuses were found apparently healthy. In four months the growth appeared again at the apex of the orbit, and a nodule of infiltration was also found outside the orbit on the surface of the malar. The mass was at once removed from the orbit and the cheek, but in two months it began to grow again at the bottom of the orbit. There was no return in the cheek.

The patient declined to have any further operation done, and she lived for eighteen months longer without much suffering, but with a rapid increase in the extent of the growth, so that before her death the orbit, nose, and maxillary sinus were filled by the tumor.

CASE XXX. A gentleman, aged 79, first seen Dec. 9, 1886. For twenty years there had been a growth at the external angle of the right lower lid, which was ulcerated, and when I saw him the orbital tissue was extensively involved, the conjunctiva and cornea were ulcerated, and the eye practically blind from cataract and opacity of the cornea. He was in feeble health, but insisted on an operation for the relief of the severe pain. The entire contents of the orbit, including the eye, were removed. His strength rapidly failed, and in less than six weeks a suspicious tumor appeared at the bottom of the orbit and along the inner wall. All his vitality seemed to be spent in the growth of the tumor, which extended very rapidly, and caused his death from exhaustion four months after the operation. At that time the tumor had filled the orbit and extended out upon the cheek.

CASE XXXI. A gentleman, aged 51, first seen May 13, 1887. Five months before a small tumor had appeared at the upper and inner angle of the orbit, which a surgeon had advised should be removed at once. This was not done, and it had increased slowly in size, and had recently begun to cause some pain. There were opacities in the lens, but in other respects the eye was normal. I advised an immediate operation, and gave a bad prognosis. He could not decide to have the operation done, and I did not see him again until September. The tumor then extended backwards along the inner wall and floor of the orbit as far as the finger could reach, and forwards between the lids, and the eye was crowded upwards and outwards. The condition was much more unfavorable, but he then consented to an operation. The entire contents of the orbit were removed, together with the eye and a piece of the optic nerve. The periosteum and sinuses did not appear to be involved. The pain was relieved at once, and he became very hopeful, but in about three weeks he began to complain of a deep-seated pain and

pressure in the orbit. Nothing was found after most careful examination, but the pain increased, he complained of general headache and fullness in the head, and of a dimness of vision in the other eye. Ophthalmoscopic examination showed beginning choked disc, which pointed to an extension backwards towards the chiasm, an unusual course for such cases to take. Two weeks later the growth could be seen in the optic foramen and sphenoidal fissure, and the head symptoms became more pronounced. He sank rapidly and died comatose, about fourteen weeks after the operation. No autopsy was allowed.

CASE XXXII. A gentleman, aged 46, first seen November 11, 1887. Nine months before, began to have pain in left orbit and left side of head, and soon after had a profuse purulent discharge from left nostril and pain was relieved. Long subject to naso-pharyngeal catarrh, and this was supposed to be an abcess in the ethmoid which had discharged. In August the pain returned in the orbit and the eye became red and painful. Early in October the left eye began to protrude and diplopia ensued. A growth could be felt on the inner wall and floor of the left orbit, and the superior nasal meatus was blocked by the same growth. Vision in the left eye was only 20/200, and there was optic neuritis with numerous hemorrhages. I gave a very unfavorable prognosis and was unwilling to operate, but he begged for relief from the pain, and I consented. The eye was enucleated and the contents of the orbit were removed. The os planum was absent and the ethmoid cells were filled with the growth. This was removed, a large opening was made into the superior nasal meatus, the nose was entirely emptied of the growth, and a careful examination was then made of the orbit. The tumor was seen projecting from the sphenoidal fissure, and probably originated in the sphenoidal sinus. The maxillary sinus was apparently not involved. Drainage was kept up through the nose for two weeks. In five weeks the growth appeared in the ethmoid cavity and apex of the orbit, and was again removed. This patient submitted to five operations. At the third operation, the ethmoid, superior maxilla, palate, and part of the sphenoid were removed, and only seemed to facilitate the return of the tumor. He died four

weeks after the fifth operation, and eleven months after the first operation.

CASE XXXIII. A gentleman, aged 44, first seen August 7, 1889. Five years ago a small tumor appeared at inner angle of left orbit, which he was advised to have removed, but declined any operation. It grew slowly in size but was painless. Exophthalmos began three years ago and the eye now protrudes downwards, outwards, and forwards, and is blind. A large growth could be felt on inner side, roof, and floor of orbit. It was hard, immovable, and non-sensitive. The eye was enucleated and was found firmly attached to the growth. The tumor was intimately adherent to the periosteum throughout its extent, and the latter was carefully stripped up and removed and the bones cauterized. The original tumor had been of rather slow growth, but within two months a nodule was observed on the floor of the orbit and grew with great rapidity, so that a month later it was as large as a large almond. At the time of its removal there was another small nodule on the inner wall and one at the apex. These being excised, a careful examination made it probable that all the bones of the orbit were diseased, and all further interference was abandoned. Within two months of this second operation, the entire orbit was filled by the tumor, and the patient, in about a year, died from general exhaustion.

CASE XXXIV. A gentleman, age 52, first seen November 17, 1891. At the age of eighteen a small tumor made its appearance at the upper and inner angle of left orbit. It grew very slowly in size and two years later was removed. Two years later it reappeared in the same spot and grew very slowly and painlessly for about three years. It then remained unchanged until a year before I saw him, a period of twenty-six years. It then began again to increase in size and when I saw him in 1891 it was as large as a lima bean. I removed it through an incision in upper lid, beneath the orbital arch. It recurred in about nine months and grew more rapidly, pushing the lid before it. Fifteen months after my first operation, the eye being nearly blind, I removed it again, together with the eye and all the contents of the orbit. Ten months later it had

nearly filled the orbit and I removed it again. In five months it had again filled the orbit and encroached upon the nose, and both cavities were thoroughly evacuated. Within a month it began again at the apex of the orbit and at the upper and inner angle of the orbit, and this nodule soon involved the inner end of the upper lid and the entire superior orbital margin. There was an infiltrated gland over the zygoma, another in front of the auricle, and several enlarged cervical glands. The tumor is hard, nodular, and sensitive. I declined to operate again, although the patient urged it. He died about a year later with head symptoms.

CASE XXXV. A young lady, aged 16, first seen April 25, 1893. Both eyes defective from high mixed astigmatism. At the age of 12, four years before, she began to complain of pain in the left orbit and the eye began to protrude. There was more or less constant headache, and vision slowly grew worse in left eye. For a year this eye had been blind. When I saw her the whole of the rear of the orbit seemed to be filled by a hard, painless tumor. Nothing abnormal in nose or pharynx. Eye enucleated and contents of orbit removed, including periosteum, to which tumor was firmly adherent. Inner, upper, and outer walls of orbit intact. In three months the disease simultaneously recurred on inner wall and floor of orbit and grew rapidly in size. After two weeks it was carefully removed and the bones were cauterized. In nine weeks to a day a nodule appeared at the apex, and two more on the floor of the orbit. They were at once removed and the places again cauterized. In two months the disease again appeared in the orbit and also in the nose, and the pre-auricular gland became enlarged. This time the tumor grew with phenomenal rapidity and filled the orbit in twenty-four days after the last operation. A fourth operation was about to be performed when the patient caught cold and died of pneumonia on the eighth day. There was a very marked tendency to cancerous disease in this patient's family.

CASE XXXVI. A gentleman, aged 53, first seen January 10, 1894. In October, 1892, this patient had a severe inflammation of the eyelids of the left eye, which was suppurative or

pseudo-membranous in character, and which ended in orbital cellulitis and loss of sight, though the eyeball did not suppurate. One year later he began to complain of pain in left orbit and soon after the left eye began to protrude. When I saw him, four months later, the eye protruded forwards, inwards, and downwards, and was immovable, and there was constant pain. A tumor could be distinctly felt on the outer wall and roof of the orbit. An operation was urged and was done at once. The eye was enucleated and the contents of the orbit were removed. The roof and outer wall were found extensively diseased, and also the floor of the orbit far back, and in one place in the roof there was a hole leading into the anterior fossa of the skull. This had not been suspected. The patient did well for about four months and then the disease seemed to return all at once in numerous foci in the orbit. The frontal headache returned with great intensity and, owing to the opening into the cranial cavity, I declined to operate again. The patient, however, lived for nearly fourteen months after the operation and died of exhaustion, with no more cerebral symptoms than the severe headache which he had so long.