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Tumors of the Orbit and Neighboring Cavities.

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TUMORS OF THE ORBIT AND NEIGHBORING CAVITIES.*

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Case I. *Spindle-cell Sarcoma of Periosteum of Orbit.*—T. D. S., a boy, aged four years and a half, was brought to me by his parents in the latter part of January, 1876, with the following history: He was a large child for his age, of the average mental development, and had always been robust in health. There was no unfavorable family history to be elicited after careful questioning, and no evidence of inherited syphilis in the child. For several months the parents had noticed a slight swelling at the outer angle of the left orbit, accompanied by slight redness of the eyeball and some swelling at the outer angle of the upper lid. These symptoms gradually increased, but there was no complaint of pain and no evidence of any disturbance of vision. When I saw the child there was a very perceptible orbital growth at the outer angle, which seemed to involve the upper and outer parts of the orbit. The left eye was pushed downward and inward, but not forward, and its motility was decidedly limited upward and outward. The upper lid was slightly swollen and drooped a little, but could be freely opened and

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shut. The growth was entirely non-sensitive. The media were perfectly clear, the iris reacted promptly, and the ophthalmoscopic examination was negative. Vision was apparently normal. There was a slight mucous discharge from the conjunctiva. A careful rhinoscopic examination revealed nothing abnormal. No history of any injury could be obtained. The boy was carefully watched, and by the middle of February the symptoms had all increased. The eye was displaced downward more decidedly and motility upward was entirely lost. For two days the child had complained of some pain. The pre-auricular gland on the left side had become swollen and somewhat painful. Ophthalmoscopic examination negative.

By the 1st of March all the symptoms were much increased in severity. A slight ulceration of the cornea appeared just above the center. The motility of the eye was limited in all directions. The pre-auricular gland was very much enlarged, but there was no other glandular infiltration. The orbital margin was swollen, and the swelling extended up on the forehead and backward into the temporal fossa. There was little or no protrusion of the eye forward and the lids could still be opened. A diagnosis was made of pure orbital tumor, probably starting in the periosteum, and owing to the somewhat rapid increase of the symptoms and the high fever of the last two days it was decided to operate and attempt to save the eye.

On March 3d the left external canthus was split, the incision being carried outward upon the temple for somewhat more than an inch. The left temporal artery was divided and at once ligated. The upper lid was then carefully dissected upward and turned over upon the forehead. After the bleeding had been checked, the orbital periosteum was found very much thickened on the outer and upper walls of the orbit. The infiltration also involved the orbital tissue as far back as the finger could extend, but did not seem to involve the capsule of the eyeball. The latter was pushed carefully toward the nasal side and held there. An incision was then made through the periosteum along the superior orbital margin, and the periosteum was then carefully stripped up from the bone on the upper and outer walls of the orbit as far back as the knife and

forceps could reach. This was removed in strips, and with it also the orbital tissue and the lacrymal gland. The periosteum was also removed from the frontal bone and temporal fossa as far as it seemed to be infiltrated, and the pre-auricular gland was carefully dissected out and removed. The orbital cavity was then washed out with a mild solution of zinc chloride and the upper lid brought down in place, and the lines of incision accurately coapted and sutured. Atropine was instilled and the eye closed with the ordinary dressings then in use. For the first three days there was considerable reaction, the lids being much swollen and the wound discharging considerable pus, so that one or two stitches had to be removed. The cornea became generally hazy, but did not slough, and eventually cleared up remarkably.

On March 15th a purulent discharge appeared from the left ear without any preceding pain, but followed by severe pain extending down on the left side of the neck and accompanied by high fever and a pulse of 140. An examination showed a perforation of the membrana tympani just back of the handle of the malleus. The discharge from the auditory canal ceased in four days, but the perforation did not close for nearly three weeks. From this time there were no adverse symptoms, and the patient was discharged at the end of the sixth week. A microscopical examination of the growth proved it to be a spindle-cell sarcoma, which had originated in the periosteum.

The little boy was carefully watched, being seen regularly once a month, but there was no return of the growth until the spring of 1880. Its progress was then very rapid, for in less than two months it filled up the entire orbit, causing marked exophthalmus and destruction of the eyeball by sloughing of the cornea. The entire contents of the orbit were then removed, including the eyeball and the entire periosteal lining as far back as the apex. The orbit was then carefully washed out with a solution of mercuric bichloride (1 to 1,000), and the lids closed and dressed in the usual manner. The patient did very well, there being little or no reaction, and he was discharged at the end of a week. He was seen at rather irregular intervals, although his parents had been warned that the growth would

probably return. In May, 1885, he presented himself with a swelling of the lower lid and cheek on the left side, which had appeared two weeks before. This proved to be a dense infiltration of the tissues of the lid and cheek springing undoubtedly from the diseased periosteum at the edge of the orbit. There was no return of the growth in the orbit, and the appearance of the external infiltration did not suggest its having spread from any complication in the maxillary sinus. The parents declined to permit any further operative interference, but allowed me to keep the boy under observation. The orbit gradually filled up with the growth, while the external infiltration steadily advanced into the temporal fossa, over toward the nose and upward upon the forehead, and the patient finally died from exhaustion, without any head symptoms, a little more than ten years after the first appearance of the tumor.

Case II. *Small cell Sarcoma of Orbit, Maxillary Antrum, Nasal Meatus, and Ethmoid Cells.*—Mrs. A. H., aged twenty-nine, came to me on June 12, 1876, with the following history: Twelve years before a small growth appeared at the external angle of the left orbit, just beneath the superior orbital margin. It was the size of a large pea, and for a number of years occasioned no discomfort and showed no tendency to increase in size. After about six years of quiescence it began slowly to grow until it reached the size of a walnut and caused a protrusion of the upper lid and external canthus, and a slight displacement of the eye inward. It then ceased growing until about four months before I saw her, when it suddenly began to increase in size and became very painful. On examination, I found the following condition of the parts: The upper lid was pushed forward and drooped considerably over the eye, but could be elevated, and the skin was of a marked dusky-red color. The eyeball was pushed downward and inward, and protruded nearly half an inch beyond the plane of the fellow-eye, and its motility was limited in all directions. The conjunctiva was injected, and the palpebral veins were engorged and prominent. The media were clear, and the retinal veins were extremely engorged and tortuous. The patient complained of a constant pain over the anterior surface of the superior

maxilla and at the infra-orbital foramen, and said that during the last four months the vision of the left eye had materially failed. She could not read, but could count fingers at twenty feet. The other eye was normal. The tumor could be seen and felt through the lid, and by careful palpation the growth could be felt along the floor and outer wall of the orbit. Rhinoscopic examination revealed a displacement of the sæptum nasi toward the right side, and a nearly complete obliteration of the left nasal meatus by what appeared to be a moderately hard mass coming from the middle meatus. Nothing could be felt with the finger posteriorly. The patient stated that for some months she had not been able to breathe through her nose. With this history and the digital examination, it seemed probable that the tumor had begun in the maxillary antrum or nasal meatus, and had involved the orbit secondarily. Assuming this to be a correct diagnosis, the patient was told that the only means of relief was an operation, but that, owing to the deep-seated nature of the growth and its probable origin, its removal would probably not be complete, and that it would be likely to return. She was also told that in all probability the eye could not be saved, but that an attempt would be made to preserve it. The vision by this time had sunk to counting fingers at two feet, and the optic disc was beginning to assume a dirty-white color. She consented to an operation, which was done on the following day. The external canthus was split, and the upper lid turned up over the forehead and held there. A further examination with the finger and large probe showed that the entire orbit was filled with the growth, and that any attempt to save the eye would prove a failure. Enucleation was immediately done, and then the entire contents of the orbit were carefully removed. After this was done the tumor could be seen projecting through a large opening in the orbital plate of the ethmoid and also through the sphenoidal fissure. It evidently filled the ethmoidal cells, extending to them from the superior and middle nasal meatus, and was of much greater extent than had been at first recognized. The orbital plate of the ethmoid was then removed, and all the growth that could be reached was dissected out. The floor of the orbit had not been

perforated, and the possibility of the antrum not being involved was recognized. The lacrymal bone was next removed, and a free opening made into the nasal meatus. This was found filled with the growth, which was removed by forceps and fingers as far down as possible. It was necessary to break down and remove the entire inner wall of the orbit, and even then the growth could not be reached without great difficulty. The meatus was cleaned entirely of the growth by working from below through the nostril as well as from above, and then the orbit, ethmoid cavity, and nasal meatus were thoroughly washed out with a solution of carbolic acid. A careful examination of the opening from the maxillary antrum into the nasal meatus was made, but no protrusion of the growth or enlargement of the opening was discovered. The orbit was then tamponed, the upper lid replaced and the canthus sutured, and the ordinary bandage applied. The patient did very well, having but little local reaction and but slight rise in temperature. She was discharged on the eighth day, with directions to report once a week until further orders. There was no return of the growth for eight months, when a small nodule was noticed in the left temporal fossa. The left nostril remained still free, and the orbit was healthy and normal in appearance. The patient was urged to allow the removal of this nodule, but declined to have it done. It grew slowly to the size of a walnut, and then remained quiescent for several months. It then suddenly began to increase, and at the same time a nodule was felt at the apex of the orbit, and another on the inner side in the cavity of the ethmoid bone. All these nodules grew rapidly, and the one in the temporal fossa soon extended from the lower margin of the zygoma upward and forward upon the forehead and backward to the auricle. The lower portion was moderately hard, but the portion which extended upon the forehead was soft, fluctuating, and very sensitive to the touch. I declined all further operative interference, as it would undoubtedly have hastened the patient's death, which occurred, after great suffering, four months later, and about thirteen years after the first appearance of the growth. Before the patient's death the orbit and nasal meatus had become entirely filled by the growth,

which had also extended back into the pharynx. The tumor removed from the orbit and neighboring cavities was sarcomatous in nature, of the small-cell variety, but in places was distinctly myxo-sarcomatous. After the patient's death I was permitted to examine the orbit, and found that the neighboring cavities, including the maxillary sinus, were entirely filled by the growth, though the floor of the orbit was still intact.

Case III. *Spindle-cell Sarcoma of Orbit and Adjacent Cavities.*—J. H., a young gentleman, aged twenty-two, consulted me in December, 1879. The left eye had been defective in vision since childhood, and occasionally squinted. For the past two weeks there had been a constant dull pain in the orbit, with ptosis and some protrusion of the eye. Examination showed limitation of motility in all directions, chemosis of the ocular conjunctiva on the temporal side, some ptosis and slight exophthalmus, media clear, fundus normal, and V. = $\frac{20}{70}$. On the floor of the orbit, reaching from the infra-orbital notch to the external canthus, was a hard, resisting growth, which pressed the lower lid forward, and which could be traced for some distance backward into the orbit. It was very sensitive to pressure. The patient refused all operative treatment.

By February 16th the exophthalmia was very marked, and the patient complained of severe occipital headache, and at times staggered when he walked. The lower lid was everted and the orbital growth was very prominent at the external angle. There was dense infiltration of the palpebral and ocular conjunctiva, the eye was immovable, the cornea was hazy, and vision was reduced to perception of light. The patient complained also of constant pain in the region of distribution of the infra-orbital nerve. He consented to an operation, and two days later the eye was enucleated and the tumor removed with comparative ease. The latter was attached very firmly to the sheath of the optic nerve and only loosely to the orbital tissue; but the latter was densely infiltrated, especially along the floor of the orbit, and on this account the entire contents of the orbit were removed down to the periosteum, which latter seemed perfectly healthy. The infiltration of the orbital tissue and the pain over the infra-orbital nerve led me to make another careful rhino-

scopic examination, but nothing abnormal was found. The tumor, on being examined, proved to be a spindle-cell sarcoma, and the orbital tissue was infiltrated with small round cells. By the middle of April, or two months after the first operation, there were well-marked signs of a recurrence of the tumor in the periosteum on the floor of the orbit. A second operation was immediately done, the periosteum, which was very much thickened, being stripped upon all sides from the orbital margin to the apex. It was very vascular, and the hæmorrhage was profuse. The orbit was then washed out with a strong solution of carbolic acid, and a careful examination with the finger was made of the floor, inner wall, sphenoidal fissure, and optic foramen, but no trace of abnormal growth could be discovered. The hæmorrhage still continued, and it became necessary to plug the orbital cavity. Violent reaction followed in the skin of the lids, cheek, and temple, and the plugging was removed the next morning. The skin of the left side of the face became decidedly erysipelatous. The reaction slowly subsided, but left both lids retracted and adherent to the external angle of the orbit, and the lower lid adherent to the inferior orbital margin for its outer third, and the cavity of the orbit was much contracted. The floor of the orbit was found intact.

Two months later, on June 25, 1880, a firm nodule, as large as a filbert, appeared over the left malar prominence. It was firmly adherent to the periosteum, but the skin was freely movable over it. In a month this nodule had increased threefold in size; it was elastic and sensitive to the touch. Another nodule, much smaller, was discovered along the lower margin of the orbit. On July 30th these two external nodules were thoroughly removed, the bone was carefully scraped and then cauterized with the actual cautery. By the first week in September, an external tumor over the malar bone had returned and had reached the size of a small pear, but it was very irregular and nodulated. The skin was drawn tightly over it and was but slightly movable. This external growth was found to be continuous with an orbital growth, which involved the floor, inner and outer walls of the orbit, while the external growth extended down upon the superior maxilla, and over into the temporal

fossa. The patient urged a fourth operation, which was done in the following way: An incision was made along the lower-lid margin as in the Arlt-Jaesche operation for entropion, and was extended an inch and a half from the external canthus toward the ear. Another incision was made from the inner end of the first incision down along the nasal furrow to the ala of the nose. This skin flap was carefully dissected up and reflected from the growth. The hæmorrhage was profuse and it was necessary to ligate several vessels. The extra-orbital portion of the growth was then thoroughly removed, and there was then revealed a ragged opening through the anterior wall of the superior maxilla into the antrum, through which the growth protruded. The growth was then removed from the orbit and here a large ragged hole was discovered through the floor of the orbit. The tumor filled the antrum, nasal meatus, ethmoid cavity, and sphenoidal fissure, and as much of it as could be reached was removed, the antrum and nasal meatus being thoroughly evacuated. The parts and cavities were then thoroughly washed out with a solution of mercuric bichloride (1 to 1,000) and the wound closed. No great reaction followed, though the temperature went up to 103°, and there was not much suppuration. The external wound healed, but in less than six weeks the growth again appeared in the orbit and externally over the malar bone. The case had long been regarded as hopeless, but the patient lingered in great suffering till the latter part of January, 1881, and died from exhaustion.

Case IV. *Epithelioma of the Lid and Sarcoma of the Orbit.*—In the latter part of September, 1880, a woman, aged forty-two, from whom I had previously removed a small growth, apparently epitheliomatous in character, from the inner angle of the left lower lid three years before, presented herself with the following history: There had been no trouble with the eye or lids for nearly two years. The eye then began to be limited in motion outward and to slightly protrude. These symptoms slowly increased, the upper lid became swollen, and a constant dull ache in the orbit began. Finally the sight of the left eye began to fail, and this frightened her and brought her to me. An examination showed the right eye to be normal in every re-

spect. In the left eye the vision was $\frac{20}{30}$ + unimproved; the media were clear; there was a grayish discoloration of the temporal half of the disc and a narrowing of the arteries. The perimeter showed a contraction of the nasal half of the field. The left upper lid was decidedly œdematous and somewhat reddened. The eyeball was pushed inward and protruded very perceptibly in advance of the plane of the other eye. There was a decided infiltration of the tissue on the temple and on the cheek just below the inferior orbital margin. The patient was told that she probably had a tumor of the orbit, and that it must be removed, but that I would attempt to save the eye, and she consented to the operation. As the exophthalmia was decidedly forward and the limitation of motility was outward, the conjunctiva was divided at the outer canthus and the wound then enlarged upward and downward with the scissors and handle of a scalpel. Almost immediately a growth was felt extending along the outer wall of the orbit and filling the entire apex. The external rectus muscle was then divided at its insertion and the eyeball turned far inward. The dissection of the tumor was then continued, but it was found so intimately connected with the sheaths of the muscles and of the optic nerve, as well as with the periosteum, that I cut through the nerve and the muscles near the apex of the orbit, as a necessary preliminary to the removal of the tumor from its orbital attachments. The growth extended on the inner side of the eye as well as on the outer side, and after considerable trouble was removed, leaving the eye in place. About three quarters of an inch of the optic nerve was removed with the tumor. The floor of the orbit appeared healthy and there was no demonstrable connection between the growth in the orbit and the infiltration in the cheek and temple. There was no reaction, and the patient was discharged at the end of ten days. The eyeball became slowly atrophic and the cornea cloudy. This case was watched very carefully, being seen every week or two, as the history of the case pointed to a recurrence of the tumor. The infiltration of the cheek and temple slowly subsided, and at the end of three months there was nothing abnormal in the patient's appearance except the phthisical eyeball. Nearly ten months after the op-

eration, however, there appeared a well-marked nodule on the external surface of the superior maxilla on the left side, just below the orbital margin and external to the infra-orbital foramen, and the diffuse infiltration reappeared on the temple. The eyeball, which had previously receded into the orbit, began again to protrude. Another careful examination was made of the naso pharynx, but nothing abnormal was discovered. As the microscopical examination of the first tumor had shown it to be a small-cell sarcoma, I advised an immediate operation including the removal of the atrophied eye, but the patient refused her consent till November, 1881, nearly four months after the reappearance of the growth. She was then suffering severe pain at times in the orbit and temple. The eye was again protruded beyond the orbital margin and the growth on the cheek had become as large as a horse-chestnut and was very sensitive. The skin was movable over this growth, which was firmly adherent to the bone. The eyeball and entire contents of the orbit were first removed. After the hæmorrhage had been checked a careful examination showed a defect in the orbital plate of the ethmoid, rather far back, and another in the floor of the orbit. A probe passed through these openings into the ethmoid cells and maxillary antrum discovered a gelatinous mass of considerable consistence in both. This was sufficient evidence that both these cavities were filled with the growth. The large nodule was then removed from the superior maxilla and the external surface of the bone carefully examined, but no opening into the antrum was found. No further attempt was made to remove the growth from the cavity of the ethmoid or the antrum, both on account of the severity of the operation and the hopelessness of any successful removal of the diseased bones. The patient made a good recovery, and there was no return of the external tumor on the surface of the superior maxilla. The disease, however, soon extended from the neighboring cavities to the orbit, and also invaded the nasal meatus and made rapid progress. The patient suffered considerable pain and the nasal cavity soon became so completely blocked that she breathed almost entirely through her mouth. In three months the growth filled the orbit and protruded between the lids and could be seen at the entrance of

the left nostril. About four months after the last operation she began to complain of intense frontal headache, which at times rendered her delirious, and in one of these severe paroxysms she had a violent convulsion. This was general in character and ended in coma from which she never rallied. An autopsy could not be obtained.

Case V. *Myxo-sarcoma of Orbit and all Adjacent Cavities.*—On January 12, 1881, a gentleman, R. M., aged thirty-eight, presented himself at my office with the following history: The first symptom which he had noticed had been a protrusion of the right eye, which began five years ago, and five months later the left eye also began to protrude. During these five years there had been a steady increase in the exophthalmia and in the limitation of motility in both eyes in all directions. There had been some pain of late, which was located at the root of the nose and just above both eyes. For a long time—but just how long he does not know—there had been difficulty in breathing through the left nostril, and for more than a year respiration was entirely abolished through both nostrils, and he had become an absolute mouth-breather. He had had several polypi removed from the right nostril at different times, with a temporary improvement in breathing.

An examination showed a marked protrusion forward and outward of both eyes, so that the lids could with difficulty be closed over them, and the axes were widely divergent. At one period of the disease there had been crossed diplopia, which subsequently disappeared. The eyes were almost immovable, and the ocular conjunctiva was deeply injected. The irides responded to light, the media were clear, and the ophthalmoscopic examination showed nothing but engorged and pulsating veins. R. E. V. = $\frac{1}{200}$. L. E. V. = perception of light. The sight had begun to fail one year ago in both eyes and had slowly grown worse. There was pain on pressure backward of the eyeballs. The posterior nares on both sides were blocked by a growth extending across the anterior pharyngeal space. The left nostril was impervious. The right nostril was blocked by a polypus, which apparently grew from the left wall of the meatus, entirely filled it, and pushed the inferior tur inated

bone and sæptum nasi over to the left side. It was soft and bled easily. The growth behind, which filled the posterior nares and extended into the pharynx, was hard and resistant, and apparently was attached to the body of the sphenoid. Nothing was discernible on the floor or inner wall of the right orbit, but in the left orbit the floor was pushed upward and the orbital plate of the ethmoid pushed outward, and I thought I could detect a tumor in the orbit. The external surface of both cheeks and temples was smooth and normal in appearance. The desperate character of the case was at once recognized, and the patient was told that a complete removal of the growth was hopeless, but that the growth could be removed from the nostrils and his respiration made more comfortable. To this he consented, and this was done both anteriorly and posteriorly. A large, gelatinous, polypoid mass, attached to the outer wall high up, was removed from the right nostril. By means of a guarded bistoury, blunt scissors, and polypus forceps, the entire mass was removed from the posterior nares, including with it a large portion of the inferior turbinated bones. The hæmorrhage at first was profuse, but was soon checked, and a careful examination of the parts made. The whole middle and superior nasal meatus were filled with the tumor, which could also be felt protruding from the opening into the left maxillary antrum. After the first week I did not see this patient again until five months had elapsed, when he came again for relief of his respiration. His condition was then deplorable. The left eye was sightless, the cornea cloudy and ulcerated, and the lids could not be closed. The growth had appeared as a large protuberance at the left inner canthus, projecting through the lids, and had also appeared at the inferior margin of the orbit and filled up the temporal fossa. He had perception of light still in the right eye, in which the optic disc was found in a condition of gray atrophy. Both nostrils had again filled up with a solid, somewhat resistant mass. I repeated the same operation, removing as much of the growth as could be reached, and again rendering the nostrils free. The mass was not polypoid, but on both occasions proved, on microscopical examination, to be myxo-sarcomatous in character. In

two months the nasal meatus had filled up again, while the growth in the right orbit had increased very rapidly. He suffered greatly from pain deep in the orbits and frontal headaches. but lived for nearly four months longer without any additional head symptoms, and finally died from exhaustion. In this case, although all the deep bones of the face and skull had become involved, the tendency of the growth had been outward. In spite of all urging an autopsy was positively refused. Before death the tumor had perforated the conjunctiva at the inner angle of the left eye, and extended over the side of the nose and down upon the cheek.

Case VI. *Melano-sarcoma of Conjunctiva and Orbit.*—Early in August, 1881, a woman, F. A., aged forty-five, consulted me and gave the following history: About two months before a small, dark nodule had appeared at the supero-temporal margin of the left cornea, seated mainly in the conjunctiva. It was slightly movable, and slowly increased to the size of a small Lima bean. When I saw her the growth had encroached somewhat upon the cornea and was painless to the touch. On August 8th I removed the tumor, which was found to be adherent to the sclera, and extended somewhat along the infero-temporal margin of the cornea. It was friable and bled easily. It was thoroughly removed, and the surface of the sclera was then scraped and cauterized, and the edges of the conjunctiva brought together loosely over the wound. I did not see the patient again until November 4th, when the growth had returned. The tumor occupied the upper, outer, and lower quadrants of the ocular conjunctiva and sclera, and covered the temporal third of the cornea. It was irregularly lobulated and somewhat flattened, dark in color, quite vascular, and non-sensitive. It extended above the eyeball into the orbit as far as the equatorial region; the eye was displaced somewhat toward the nose, and its motility upward and inward was limited. The field of vision was limited on the temporal side, but central vision was still $\frac{20}{20}+$, and the fundus was normal. The patient was told that the eye must be enucleated at once, and on November 21st the entire contents of the orbit, including tumor, eyeball, and ocular conjunctiva, were removed. The optic nerve was divided

far back and looked perfectly healthy, and the periosteum of the orbit also appeared normal. The case did well, and there was nothing abnormal noticed until the following June, 1882, when a small, dark nodule was found on the outer wall of the orbit about halfway back. The patient declined another operation, and I did not see her till the last of October, when the growth filled the orbit and protruded between the lids. It seemed as yet to be confined to the orbit, for the naso-pharynx was clear and there was no evidence of any trouble in the maxillary antrum. The patient now consented to an operation, and on November 2, 1882, the entire contents of the orbit were removed with ease, though the hæmorrhage was profuse. The periosteum was then cut through all round the orbital margin, and was stripped up on all sides as far as the apex of the orbit and removed. After the hæmorrhage had ceased, the bone was thoroughly scraped, and then the orbit was washed out with a sublimate solution (1 to 1,000). There was little or no suppuration and the raw surface soon healed. I saw this patient at intervals until the autumn of 1886, a period of four years, and there was no return of the tumor in that interval. She then disappeared from observation, and I have heard nothing of her since. All the specimens removed at different times and examined proved to be true melano-sarcoma. The eyeball on examination proved a very interesting specimen. The tumor was almost entirely superficial and extrinsic. None of the tissues of the eye were invaded by the growth except the sclera, and even here only the superficial layers were infiltrated by the sarcoma cells. The region of the lymphatic channels around the openings of the vasa vorticosa was entirely free from any infiltration, as were also the sheath of the optic nerve and the nerve itself.

Case VII. *Fibro-sarcoma of the Orbit.*—A gentleman, H. A., aged twenty-two, first seen on June 12, 1882, gave the following history: Has always been perfectly well, and has never noticed anything abnormal about his eyes until five months ago, when the right eye began to protrude. Since then the exophthalmus has slowly but steadily increased, but there has never been any pain. The vision of the right eye remained good

until ten days ago, when it suddenly and rapidly became impaired, and now he says it is entirely blind. An examination showed that vision was reduced to perception of light. The protrusion of the eye was forward and slightly outward, and motility outward and inward was decidedly impaired. The iris reacted, the media were clear, and the fundus showed a well-marked condition of papillitis with hæmorrhages. At the inner side of the orbit a tumor could be felt, apparently springing from the inner wall of the orbit, and sensitive on pressure. The left eye was normal in every respect. The patient was told the probable nature of the trouble and consented to an operation, which was done on June 14th. The external canthus was incised for the distance of an inch outward and the upper lid turned up on the eyebrow. The ocular conjunctiva was divided in the horizontal meridian from the internal canthus to the corneal margin. The tendon of the internal rectus muscle was divided and the eye turned strongly to the temple. The tumor could then be plainly seen on the inner wall of the orbit, its anterior aspect being flattened. By means of blunt hook and blunt-pointed scissors it was readily dissected from its periosteal adhesions and removed entire, with but trifling hæmorrhage. It proved to be a long, flattened growth, the size of a large Lima bean, and was apparently entirely inclosed in a capsule. A careful examination of the orbit discovered no trace of any further growth, and the muscles and optic nerve seemed to be intact, though the latter was somewhat flattened. The cavity was then carefully washed out with a sublimate solution (1 to 2,000), the tendon of the internal rectus was stitched in place to the sclera, the conjunctiva brought together and closed over the opening with sutures, and the slight wound in the canthus closed in the same way. The eye was then bandaged in the usual way. Not a drop of suppuration occurred, and the patient was discharged at the end of a week. The tumor was hardened and sections were carefully made in all directions. It proved to be entirely inclosed in a fibrous capsule, and was divided into several parts by fibrous trabeculæ, which seemed to be prolongations inward of the fibrous capsule. The spaces between the trabeculæ were filled with

large and small round cells, with nucleus and granular contents. Regarded as a whole, the growth would be classed as a sarcoma, or possibly a fibro-sarcoma, as there were a few fusiform cells between the fibers of the trabeculæ. The superior oblique muscle was not injured. The patient's vision slowly improved, so that at the end of a month he could count fingers at three feet from the eye, but beyond this it did not improve, and eventually the optic disc took on the appearance of gray atrophy. The patient was last seen in the autumn of 1884, a period of more than two years, during which there had been no return of the growth, and from the encapsulated condition of the tumor it is probably safe to conclude that it has not reappeared.

Case VIII. *Fibro-sarcoma of the Sheath of the Optic Nerve and Orbit.*—Fanny S., aged seventeen, was first seen on September 24, 1884. Two years before she had suffered from an attack of meningitis, during which the vision of both eyes became affected, and has since grown slowly but steadily worse. She has been deaf in both ears for eight years, the cause being catarrhal inflammation of the middle ear extending from the naso-pharynx. The right eye began to protrude about a year ago, and the exophthalmus has slowly increased, but without any pain. When I saw her, the right eye protruded forward and outward and was limited in motion in all directions. The iris was moderately dilated and immovable. The fundus showed a gray, atrophic disc. Vision was $\frac{20}{200}$. There was marked engorgement of the subconjunctival and episcleral veins. The cornea was slightly cloudy from old keratitis. In the left eye the cornea was still more cloudy, and the iris was dilated above the normal and very sluggish. The optic disc was discolored on the temporal side and the retinal veins looked engorged. Vision was $\frac{20}{100}$. There was no exophthalmia and no limitation of motility. An examination of the naso-pharynx showed nothing abnormal beyond a general hypertrophy of the mucous membrane. There was no trace of any growth. When the right eye was pressed backward, a hard resisting mass was felt at the bottom of the orbit. A diagnosis of orbital tumor on the right side was somewhat hypothetical, and the patient was told that

she must await developments. The exophthalmia slowly increased and vision slowly grew worse, but nothing absolutely certain was discovered until eight months had elapsed, when a growth was for the first time felt on the nasal side of the orbit. The patient was then told that an operation was necessary and that the eye must be enucleated, to which she consented. The eyeball was first removed in the ordinary way, great difficulty being met with in cutting the optic nerve; and, on examining the eye after removal, the whole nerve was found to be enveloped in a dense fibrous mass, showing that the tumor had been cut through. The entire contents of the orbit, including the conjunctiva, were then removed, considerable dissection being necessary around the optic foramen. The periosteum was apparently healthy except at the apex of the orbit, where it was much roughened from the adhesions to the growth. The latter measured about three quarters of an inch in length and was roughly molded to the shape of the orbit. The optic nerve passed nearly through its center and was decidedly flattened. The orbit was then washed out antiseptically and bandaged in the usual way. There was no defect in the orbital walls, and no apparent prolongation of the tumor into any of the neighboring cavities. A careful examination of the growth, after hardening, showed that it mainly involved the sheath of the optic nerve, the nerve itself being but slightly encroached upon. It could not positively be decided whether the tumor had originated in the sheath or in the periosteum of the orbit. It extended forward upon the sclerotic for a short distance, this membrane being intimately involved in the pathological process. Sections through the tumor, both longitudinally and transversely, showed it to be composed almost entirely of connective tissue bundles, the fibers being densely pressed together. In some places between the fibers were a few fusiform cells. The nearer the optic nerve was approached the denser became the fibers. The cells in the perineural lymphatic space were increased in number and size. The optic nerve behind the eye and within the tumor was flattened and showed signs of interstitial neuritis. The optic disc and the immediately surrounding zone of the retina showed the traces of neuro-retinitis, but

the rest of the eyeball, with the exception of the cornea, was normal.

The patient rapidly recovered and has been carefully watched since, but no return of the tumor has been observed. An interesting feature in the case is the possible, I might almost say the probable, connection between the preceding meningitis as a cause and the development of the orbital tumor as the effect. We know that complications on the side of the eye are by no means infrequent during or after the meningeal disease. The ocular complication is sometimes a purulent chorioiditis, but more often it is a neuro-retinitis, with or without papillitis. It is by no means an improbable supposition that, in the case just described, the intracranial inflammation extended along the membranes of the brain, involved the dural sheath of the optic nerve, and set up a hypertrophic vaginitis, which subsequently took on the form of a tumor of the optic nerve, or more properly of the nerve sheath, compressing the optic nerve and producing the exophthalmus.

Case IX. *Cyst of the Orbit and Ethmoid Cells.*—On October 6, 1884, a young child, Jennie S., aged two years and a half, was brought to me by the mother, who gave the following history: About a year before, after an attack of bronchitis, the mother noticed a small swelling at the inner angle of the left orbit beneath the upper lid which caused the lid to protrude. This was much less marked when the child was lying down than when she was in an erect position. It had grown somewhat in size during the year. There had been no other symptom. When I saw the child there was a small circumscribed orbital growth at the upper and inner angle of the left orbit, beneath the upper lid and outside the periosteum. When the child sat or stood the protrusion occupied the region of the inner canthus above the lacrymal sac, but when she lay down it receded almost entirely from view. It felt elastic and I concluded it was an example of a retention cyst of the orbit. The tumor was punctured through the *cul-de-sac* beneath the lid, and a quantity of clear, straw-colored fluid escaped, and the cyst at once collapsed. I told the mother that the little tumor might return, but that the child was so young it might be better to wait and see whether

any more serious operation would be necessary. For nearly three months there was no return of the cyst. Then it began to fill up again and soon regained its former dimensions. The mother also noticed that when the head was bent forward the swelling became much more prominent than ever before. I then determined to attempt the removal of the entire cyst, still regarding it as a retention cyst developed in the orbital tissue. The upper lid was strongly everted and the eyeball turned to the outer canthus and held there by a strong suture passed through the conjunctiva on the nasal side of the cornea, crossing the cornea and passing through the skin of the external canthus. The *cul-de-sac* was then opened at the inner canthus and the cyst at once presented. It extended well up under the arch of the orbit and far back into the orbit, but seemed to hug the inner wall. Its attachments to the orbital tissue were very slight and easily broken, but on the side of the bone they were more firm, and in endeavoring to separate the cyst wall from one of these adhesions the sac ruptured and a large quantity of cloudy yellowish fluid escaped. The cyst collapsed and my finger passed into a large cavity. An examination showed that the orbital plate of the ethmoid bone and most of the lacrymal bone were absent and that the ethmoid cells formed one large cavity which communicated with the superior nasal meatus. This was proved by the fluid used in washing out the orbit and cavity in the bone passing down and out through the nostril. A drainage-tube was then inserted. The little patient did very well. There was hardly any suppuration, the drainage-tube was removed on the third day, and the child was discharged on the eighth day. There has been no return of the disease, but there was rather a marked sinking in of the tissues at the inner canthus and beneath the inner end of the orbit, so that there is a decided difference in the appearance of the two eyes.

If there had been a carious process in the bone which led to the disappearance of the inner wall of the orbit, there would almost certainly have been some general as well as local symptoms in the child during the process. For this reason I am more inclined to regard the case as one of congenital absence or arrest of development of the inner wall of the orbit, and the cystoid

development in the cavity of the ethmoid and orbit as the result of a chronic catarrhal irritation of the nasal passages, perhaps connected with the bronchitis from which the child had suffered.

Case X. *Sarcoma of the Nose, Nasal Meatus, and Orbit.*—Early in November, 1884, I was called in consultation to see a gentleman, aged fifty two, and learned the following history of his case: For many years he had been a sufferer from lupus of the face, which had first appeared as a small nodule on the left ala of the nose. It slowly extended in several different directions, healing as it extended, until the cicatrix and the sore covered a space as large as a silver half-dollar. It then remained quiescent for nearly two years, but subsequently extended upon the left side of the nose and orifice of the left nostril. During the past year its growth had been rather more rapid. When I saw him the growth had entirely occluded the left nostril, filled the posterior nares, and extended over the cheek and malar prominence and slightly into the orbit from the outside, pushing the eye upward, outward, and forward. It had also extended into the zygomatic fossa. The eyeball was still freely movable and the axes of the two eyes could be made parallel, when the diplopia which ordinarily existed disappeared. Vision was normal, the media were clear, and the fundus was healthy.

My opinion had been desired in regard to the advisability and feasibility of an operation, and I advised against any attempt to remove the external portion of the growth, on account of the great extent of diseased tissue and the impossibility of procuring a flap of sound skin of sufficient size to close the wound. There also seemed a probability that the growth had extended from the nasal meatus to the maxillary antrum, and any attempt to remove this part of the growth would have necessitated the removal of the anterior bony wall of the antrum. The growth in the naso-pharynx might be removed, and this would render the patient much more comfortable and his respiration easy, and this I advised should be done.

On November 13th the patient was etherized and with some difficulty the left nostril and naso-pharynx were cleared of the growth, part being removed through the nostril and part

through the pharynx. The sæptum nasi was found driven over to the right side, and the growth had extended far up the nasal cavity on the left side beyond the reach of operative interference. The immediate result was a great improvement in the patient's comfort, which remained for nearly six months before his respiration became again obstructed. I declined any further interference on account of the hopelessness of the case. The progress of the disease was slow but steady. The whole left side of the face became gradually involved, the disease extending down to the angle of the jaw, over on the temple, and up on the forehead and bridge of the nose. The orbit filled up, apparently from the orbital margin, and the eye was pushed forward and inward toward the nose; the eyelids became involved, the cornea ulcerated and then perforated, and a large staphyloma developed and protruded between the swollen and half-closed lids. The patient lived for two years and a half after the operation, suffered greatly, and finally died from exhaustion. Throughout the entire course of the disease the progress had been from without inward, and the resulting disfigurement was unpleasant in the extreme. No autopsy was permitted, and thus no opportunity was offered of determining whether there had been any change in the microscopical character of the growth. Before I first saw the patient portions of tissue had been removed from the external growth on the nose and had proved to be lupus. The portion removed from the interior of the nose had the mixed appearance of both lupus and sarcoma.

Case XI. *Caries and Abscess of the Orbital Walls.*—A little boy, R. P., aged three, was brought to me in November, 1884, with the following history: About two weeks before, the mother had noticed a staring appearance of the right eye, which increased to a positive protrusion of the eye. When I saw the child the lids were somewhat reddened and the exophthalmia was directly forward. Pressure of the eye backward gave an elastic sensation and caused some pain. Inquiry developed the fact that the child had had some symptoms of congenital syphilis at birth and that the father was undoubtedly syphilitic. The case was watched for several weeks, but nothing abnormal

was observed except a slow increase in the exophthalmus. The eyeball was apparently normal in every respect. I suspected the presence of either a cyst or an abscess and advised an exploratory puncture. This was done and a small trocar was passed into the orbital tissue on the nasal side of the eye, but with no result. No trace of any growth could be felt in the orbit, and nothing was found in the nasal meatus or nasopharynx. The exploratory puncture, however, seemed to set up a more active process in the orbit, for the exophthalmus rapidly grew worse and the child began to complain of constant pain. A more extensive operation was then proposed and consented to by the parents. The conjunctiva was opened horizontally on the temporal side, the tendon of the external rectus was divided, and the eye turned strongly to the nose. The finger was then introduced and almost immediately felt a tumor, which seemed to occupy the apex of the orbit and to be firmly attached to the outer wall of the orbit far back. It had no attachments to the eyeball, and was easily detached from the orbital tissue and sheath of the optic nerve, but was with great difficulty separated from the periosteum on the outer wall of the orbit. In doing this the sac wall was ruptured far back and a quantity of ill-smelling pus came out, and the tumor collapsed. The sac wall was then carefully removed as far as possible, and the little finger being introduced discovered a small patch of denuded bone far back on the outer wall of the orbit. There had evidently been a focus of periostitis or perhaps of osteitis with caries, and an abscess had developed in the orbital tissue. The dead bone was scraped as well as possible, the cavity thoroughly washed out with a solution of sublimate (1 to 2,000), and a loop of carbolized silk inserted for drainage.

The case did remarkably well. Some suppuration occurred from the orbital tissue and from the suture points which united the tendon of the external rectus, but this ceased within the first week. The eyeball gradually receded within the orbit, and in two months scarcely a trace of the operation was left. There has been no return of the orbital trouble, but the child has had a rather severe osteitis in the right ankle joint, from which he eventually recovered.

Case XII. *Myxo-sarcoma of the Orbit and Adjacent Cavities.*—A young woman, K. M., aged twenty-one, was brought to me on January 12, 1885. Three months before, she began to be troubled with epiphora in the left eye, and very shortly after she noticed a small tumor along the orbital margin just beneath the lower lid and at about its middle. It was painless and occasioned no annoyance. This has increased in size and now begins to push the lower lid forward. Careful examination proved that the tumor could be plainly felt in the orbital cavity, lying along the floor of the orbit beneath the eye and extending up slightly upon the inner wall. On being questioned, the patient stated that for more than a year she had suffered from a pain in the cheek just beneath the orbital margin, which was dull in character but never severe, and she had considered it neuralgia. The teeth were examined and several were found badly decayed, with large cavities. The nose and nasal meatus were examined, but nothing specially abnormal found. A diagnosis was made of tumor of the orbit, with the possibility of its origin in the maxillary antrum and subsequent perforation of the floor of the orbit. Both eyes were normal in every respect. The patient was advised to have the growth removed before the vision of the eye became affected, but declined all interference. In two weeks she came again and a great change in her appearance had occurred. The growth of the tumor had been very rapid. The eyeball was displaced upward and outward and vision was reduced to $\frac{2}{3}\frac{0}{0}$. The lids were swollen and protruded perceptibly. The growth covered the entire floor of the orbit, extended over the inner wall and involved the orbital plate of the ethmoid, and had spread over the lower edge of the orbit and down upon the anterior surface of the superior maxilla. She was then eager for an operation, although she was told that in all probability the eye could not be saved. The nose and pharynx were again carefully examined, but nothing abnormal was found.

On January 30th I enucleated the eye and then found that nearly the whole orbit was filled with the growth. It varied in consistence, being in some places hard and in others soft. In examining the floor of the orbit, the probe passed into a

cavity, showing that communication with the antrum existed. The orbit was thoroughly cleaned out in the usual way, and a large opening was then discovered in the floor of the orbit, which extended nearly to the orbital margin, and the growth could be seen and felt in the antrum. The extra-orbital portion of the growth was then removed from the surface of the upper jaw and was found closely united with the periosteum. The antrum was then emptied of its contents, and an examination showed that the growth had not apparently extended into the nose. The cavity of the antrum and the orbit was carefully washed out with bichloride solution (1 to 2,000), and the surface of the periosteum thoroughly scraped and cauterized. The patient recovered rapidly and went home at the end of two weeks. She was told that the tumor would almost certainly return, and that she must be seen at short intervals. I did not see or hear of her for nearly a year, and then she came with a return of the growth just beneath the lower margin of the orbit, on the superior maxilla. There was no sign of the recurrence of the tumor in the orbit, and the antrum was empty except for a considerable amount of thick, glairy mucus. The pain in the upper jaw had appeared at intervals, but did not last long. The external growth was removed through the lower *cul-de-sac*, the latter being incised throughout nearly its entire length, and the lid depressed. After the nodule had been dissected out, the bone was thoroughly scraped and then cauterized with the actual cautery. Considerable suppuration followed this operation, and the lid remained everted for several weeks, but eventually this defect entirely disappeared. I saw this patient at intervals for several months, but she then disappeared and I have heard nothing of her since. The growth in the orbit, on microscopic examination, proved to be of a mixed nature. The denser portion of the tumor was pure sarcoma of the small-cell variety. The softer portion, together with the growth in the antrum, was myxo-sarcomatous in character. It was impossible to decide, from an examination of the tumor and of the orbit and antrum, where the disease originated, though the combined evidence was rather in favor of the antrum.

Case XIII. *Cyst of the Ethmoid Cells and Orbit.*—Early in March, 1885, a man, C. K. aged twenty-eight, came to me with a very incomplete and fragmentary history of trouble in the orbit on the left side. There had been a dull pain in the orbit and left side of the head for some months. It was constant but never severe. Lately there had been some failure of the vision and some prominence of the eyeball. He had had two decayed teeth removed, one from each jaw on the left side, but the pain continued. An examination showed a very slight prominence of the eyeball, with V. = $\frac{20}{40}$, clear media and a normal fundus. On the inner side of the left orbit, far back, a slight elastic prominence could be felt. The naso-pharynx was examined, but beyond a chronic catarrhal condition, with rather profuse secretion, nothing abnormal was discovered. The pain was now confined to the supra orbital region and the root of the nose. There seemed nothing to do but to watch the patient and await developments. One month later there seemed a slight increase in the elastic prominence on the nasal side of the orbit, and, a small trocar being introduced, a small quantity of yellowish, turbid fluid was evacuated. During the next day this continued to dribble through the wound and beneath the conjunctiva. That night the patient slept well, but toward morning he woke up with a feeling of a severe cold in his head. In endeavoring to clear his nose he made several violent expiratory efforts, and finally an immense mass of fluid and gelatinous discharge was passed through the nostrils, and he felt as if something had given way in his eye. He came to see me early in the morning. The discharge was still coming from the nose, and the ocular conjunctiva was swollen and distended all round the cornea, as in a case of extreme chemosis. The diagnosis was now somewhat easier. As a consequence of the chronic nasal catarrh, there had been an accumulation of fluid in the upper nasal meatus, ethmoid cells, and probably the frontal sinus. As a result of the pressure, either one of the fissures in the orbital plate of the ethmoid had been widened or the bone itself had been worn away, thus forming a communication with the orbit and the development of an apparent cyst in the orbit. This was punctured and the contents flowed out beneath the conjunctiva.

The violent expiratory efforts had produced an enlargement of this opening in the ethmoid plate and an evacuation of a large quantity of fluid discharge into the orbital tissue, as well as through the nose. I punctured the conjunctiva in several places, and had the eye and conjunctival *cul-de-sac* irrigated every two hours with a sublimate solution (1 to 5,000), while the naso-pharynx was frequently washed out with a saturated solution of warm potassium chlorate. The patient recovered without an adverse symptom, and vision was gradually restored to the normal standard.

Case XIV. *Disease of the Maxillary Antrum, involving the Orbit.*—In the latter part of September, 1885, a gentleman, Mr. W., aged fifty-eight, came to me with the following complaint: In October, 1884, he began to have a dull pain in the right side of the face, near the external angle of the right eye and over the malar prominence, which lasted for some months. Thinking it might come from the teeth, he consulted his dentist, who extracted the third and fourth molars from the upper jaw on the right side, which were badly decayed. The fangs of the fourth molar had penetrated the antrum. For more than a month after the removal of the teeth there had been a slight offensive discharge into the mouth from the alveolar opening into the antrum, but this ceased and was followed by a more or less profuse purulent discharge through the right nostril and into the pharynx. The dull ache over the malar prominence still continued and was supplemented by pain in the region of the right frontal sinus. In June, 1885, the right eye was noticed to be on a higher level than the left eye and to be somewhat more prominent. He consulted an oculist in a neighboring city, who told him that there was a tumor in the orbit and that the eye must be removed. There was at this time no impairment of vision, but during the summer he began to have vertical diplopia. When I saw him there was a slight difference in elevation of the two eyes but no exophthalmia, and the right eye could be moved freely in all directions. Shortly after his first visit the purulent discharge from the nostril, which had been very slight for some months, became again profuse, and the right eye was restored to its normal position and the diplopia

almost entirely disappeared This induced me to believe that the trouble was entirely in the antrum and was of the nature of an abscess, and I urged an operation. To this the patient objected, as his condition was very comfortable and the frontal pain had subsided, and I did not see him again until March, 1886. At that time the discharge from the nose had nearly ceased, the right eye was displaced decidedly upward and somewhat outward, and was distinctly protruding from the orbit. The diplopia was more marked than ever, and the pain over the malar bone and frontal sinus was at times severe. The nasopharynx showed little abnormal. Vision in the right eye was still perfect and the ophtha'moscope gave a negative result. Influenced by my experience with a former very similar though less severe case, which I had transferred to the care of a general surgeon who operated on the patient with excellent results, I urged an operation on the antrum through the mouth, and to this the patient consented.

The alveolar opening at the root of the fourth molar still existed, though closed by mucous membrane. This I enlarged with small bone forceps, first dissecting away the mucous membrane and gum. There followed at once the discharge of an immense amount of apparently healthy pus. The antrum was then irrigated with a warm saturated solution of boric acid, the irrigation being continued until the fluid returned clear. The cavity was then filled with a solution of sublimate (1 to 5,000) and the opening temporarily plugged. The nose and orbit were then carefully examined. Some of the fluid escaped through the nose. The floor of the orbit, which had been pushed upward, had receded, and proved to be excessively thin but apparently unperforated. The plug was then removed from the opening in the antrum, the sublimate solution allowed to run out, and the antrum again irrigated several times with the boric-acid solution.

The result was extremely satisfactory. There was no reaction, and the patient rapidly recovered. A thin semi-purulent discharge continued for about two weeks, but the cavity was washed out twice daily, and at the end of the second month the patient was discharged cured.

Case XV. *Small-cell Sarcoma of the Orbit and Adjacent Cavities.*—About the middle of May, 1886, a gentleman, C., aged thirty-two, consulted me in regard to one of his eyes. About six months before, he had noticed a small nodule at the inner canthus of the left eye, which at first looked like an enlargement of the caruncle. This slowly increased in size until it projected outside the canthus between the edges of the closed lids. While in Europe he consulted a surgeon, who removed the growth together with the caruncle. It returned within two months, and increased rapidly in size and occasioned great discomfort. When I saw him the growth involved the entire inner canthus, including the conjunctival folds, the ocular conjunctiva as far as the corneal margin throughout the nasal half, both *culs-de sac*, and had extended deeply into the orbit along the inner wall, being apparently closely connected with the periosteum over the lacrymal and ethmoid bones. The inner ends of both lids were also infiltrated. The eye was limited in motility in all directions, except outward. The media were clear, the fundus was healthy, and vision was normal. I advised a very complete and radical operation—viz., the enucleation of the eye, the removal of the entire contents of the orbit, including the periosteum if necessary, and of the inner halves of both lids. To this the patient would not consent and went home, but subsequently submitted to an operation by a local surgeon, the exact nature of which I do not know, but it included the enucleation of the eye. The tumor again returned within two months and grew with great rapidity, so that less than four months after the second operation, when he again consulted me, the growth had filled the orbit, involving nearly the whole of both lids, the cheek, side of the nose, and temple. The left nostril was also occluded, though by what could not be ascertained definitely, but probably by a prolongation of the growth from above. Inasmuch as nearly all the deep bones of the face were involved, as well as the adjacent cavities, I declined to operate, but I removed a piece of the orbital growth for examination. The patient returned home and a fourth operation was done, but he died within two weeks of exhaustion. The microscopical examination of the portion of orbital growth removed

by me proved it to be a small-cell sarcoma. I subsequently learned that the family history of the patient showed a distinctly cancerous tendency. His mother had been operated upon for cancer of the breast, and had subsequently died of the disease. A maternal aunt had died of cancer of the uterus, and so had his maternal grandmother.

Case XVI. *Small-cell Sarcoma of the Arm and Orbit.*—In the latter part of December, 1887, a little boy, aged three, was brought to me, which proved to be a case of great interest. About fourteen months before, the child had received an injury to the left arm from a fall. The exact nature of this injury I could not ascertain, but it was not a fracture. From this injury there resulted a tumor, which involved the left upper arm from the elbow to the head of the humerus, and the glands in the axilla were infiltrated. Some time during the summer of 1887 the left arm was amputated at the shoulder joint and the enlarged glands were removed from the axilla. The mother said the tumor proved to be a cancer on examination with the microscope. Soon after the amputation of the arm the right eye was noticed to be more prominent than the left eye, and the upper lid drooped. When I first saw the child the exophthalmus was forward, downward, and outward, and the infiltration of the lid was marked. The evidence of the presence of an orbital tumor was unmistakable, and the parents were told of the probable malignancy of the growth and of its connection with the tumor in the arm. The presence of the same trouble in the lid was inferred from its swollen, infiltrated condition, and the hard sensation it gave when compressed between the fingers. I advised that the orbit be emptied of its contents, including the eyeball, that the upper lid be removed, and that the orbit be closed up by a plastic operation. This advice was declined, and I heard nothing of the child until four weeks later, when the father informed me that the child was ill with pneumonia. Death followed on the third day, and I received permission to remove the contents of the orbit, including the eyeball. The tumor had grown very rapidly, and was closely adherent to the periosteum and to the sheath of the optic nerve, so that the eye and the tumor were removed together. The

growth had also extended into the sphenoidal fissure and over on the cheek. It proved to be a small-cell sarcoma, very vascular, arising from the periosteum, and involving in its growth the sheath of the optic nerve, the intravaginal lymphatic space being filled with small round cells, similar to those in the main growth. None of the tissues of the eyeball itself were invaded by the growth. I was not permitted to make any further examination of the body.

Case XVII. *Fibro-sarcoma of the Orbit.*—I was consulted in March, 1889, by a gentleman, J. W., aged forty, who told me that the vision of the right eye had been defective from early childhood, although it could be somewhat improved by glasses, which he sometimes wore. Three months before, vertical diplopia suddenly appeared, preceded by a severe pain in the left eye, and the double vision had persisted ever since. He thought also that the left eye was somewhat more prominent than it had been. For the last six weeks the upper lid on the left side had been swollen. When I saw him the left upper lid was swollen and seemed to be pushed downward. The left eye protruded forward, downward, and outward, but the motility was not greatly impaired, except upward. Media clear and fundus normal in both eyes. Diplopia upward and to the right for all large objects. R. E., $\frac{20}{20}$; with cyl. —D. 2·75, axis 90° = $\frac{20}{15}$. L. E., $\frac{20}{40}$; with cyl. —D. 0·50, axis 90° = $\frac{20}{20}$—. Just beneath the superior orbital margin on the left side, near the inner angle of the orbit, and reaching nearly to the outer angle of the orbit, was an elastic, nodular mass, extending backward for some distance and apparently closely connected with the roof of the orbit. The naso pharynx was normal, as was also the orbit on the opposite side. The patient was told that he had an orbital tumor, and that, if an operation were done for its removal at once, the eye might be saved. He consented, and the operation was appointed for the next day.

The location of the tumor was such that it was necessary to displace the eyeball downward and outward as far as possible, and this was done without dividing any one of the ocular muscles. The conjunctiva was divided through the upper *cul-de-sac*, the incision extending the whole length of the superior or-

bital margin. The adhesions between the orbital tissue and eyeball, and between the latter and the tumor, were then carefully broken through with the finger and a strabismus hook, which was easily done, as none of the adhesions were firm. It was then found that the tumor involved nearly the entire roof of the orbit, and extended as far back as the finger could reach. It was flattened in the center by pressure on the eyeball, but was thicker on the temporal and nasal sides. It was very firmly attached to the periosteum of the roof, and its dissection was extremely tedious. Great care had to be exercised to avoid wounding the pulley of the superior oblique, and, at the apex of the orbit, to avoid injury to the optic nerve and superior oblique and superior rectus muscles. After its removal, as much of the periosteum of the roof as could be reached was stripped off and removed and the underlying bone scraped. The hole was then thoroughly irrigated with sublimate solution (1 to 2,000), the wound in the *cul-de sac* carefully closed by a number of sutures, and the eye bandaged. There was scarcely any reaction, but the infiltration in the upper lid subsided very slowly. At the end of a week the eyes were tested for diplopia, and it was found that the superior oblique had been injured during the operation, the relation of the double images to each other being quite characteristic. This persisted for more than four months, but eventually nearly entirely disappeared. The eyeball resumed its normal position, but slowly. This patient still is under observation at somewhat long intervals, but there has been as yet no trace of a recurrence of the disease, a period of three years and a half since the operation. The tumor was very carefully examined, and proved to be a fibro-sarcoma, with a very large preponderance of dense fibrous tissue and but comparatively few cells, which were of the fusiform variety.

Case XVIII. *Spindle cell Sarcoma of the Eyelid, Orbit, and Adjacent Cavities.*—Early in April, 1889, a man was sent to my office with the following history: He was twenty-three years of age, apparently in perfect health, with unusually fine muscular development. Five or six weeks before, he had first noticed a small lump in the lower lid of the left eye, near the inner canthus. It was at first movable and painless, but increased

rapidly in size, became painful, and led him to seek advice. When I saw him the lower lid was swollen, reddened, and partially everted. The growth had extended downward and outward over the superior maxillary and malar bones, and backward into the orbit, along the floor and inner wall. It was irregularly nodulated, and the skin was freely movable over it. The left eye was limited in motility inward and downward. Both eyes were normal in every respect. The naso-pharynx was apparently healthy. It was impossible to determine by the examination whether the growth had begun in the orbit or in the eyelid. I gave an unfavorable prognosis, and told him that the only advice I could give him was to have an operation for the removal of the tumor done as speedily as possible, and that it would necessitate the loss of part of the eyelid and possibly of the eye itself. He agreed to do whatever I advised, and the operation was done on the second day following my examination.

The internal canthus was split by a horizontal incision extending to the bridge of the nose. The lower lid was then split into an anterior lamina of skin and orbicularis muscle, which seemed to be healthy, and a posterior lamina containing the tarsus, conjunctiva, and connective tissue, as in the old Arlt-Jaesche operation for entropion. The incision was carried from the outer end of the first incision outward to the middle of the lid, and extended vertically downward to the level of the lower margin of the orbit. This was done because the skin of the lid seemed healthy. The ocular conjunctiva was then dissected free from the nasal half of the eyeball, being cut entirely across along the lower orbital margin and inner side of the orbit, and turned over on the cornea. It was then seen that to reach the extra-orbital portion of the growth the lower lid must be cut in half down to the orbital margin, which was done and the halves of the lid turned as far as possible out of the way. The growth was not very adherent to the underlying bone outside and was somewhat easily removed by the scissors and forceps. Inside the orbit it was more flattened out and adherent to the bone, especially along the floor of the orbit, and here the process of dissection was much more slow. It extended about

two thirds of the way back into the orbit, was closely attached to the periosteum but not at all to the eyeball, which was readily pushed out of the way. After nearly an hour's work the tumor was apparently entirely removed, and a careful examination was then made of the floor and inner wall of the orbit, without discovering any remains of the growth. The bone was then scraped and the cavity in the orbit washed out with a sublimate solution (1 to 5,000). The inner half of the lid, consisting of skin and muscular tissue, was then cut away and removed, and the vacancy filled by a flap of skin taken from the forehead and root of the nose, twisted on its base, and united with the inner end of the outer half of the lid by suture pins and the necessary sutures. There was considerable reaction on the next three days, but almost no suppuration, and the flap healed well, so that the patient was discharged from treatment in about five weeks with a very presentable lower lid. Nothing more was heard from the patient for a period of eight months, when he presented himself with an unmistakable return of the growth in the orbit and eyelid. A very radical operation, including the removal of the eyeball, was the only advice I could give him, and this he declined. Nearly a year later an operation was done in a distant city for the removal of the growth, which had attained enormous proportions. The nature of the operation was unknown to me, but it involved the removal of several large pieces of bone, probably the superior maxilla and ethmoid. He recovered from this operation, but died soon after from some cerebral complication, and an autopsy was not allowed.

The tumor removed by me at the first operation proved to be a sarcoma of the spindle-cell variety, with considerable fibrous tissue scattered throughout, and contained but very few blood-vessels.

Case XIX. *Small-cell Sarcoma of the Orbit, Eyeball, and Adjacent Cavities.*—On October 4, 1889, a woman, aged thirty-five, was brought to me with the following history: For about a year she had suffered from severe neuralgia in the right side of the head and right orbit. She had had defective vision in both eyes for four or five years, but had never consulted any physi-

cian. Four days before I saw her she suddenly discovered that she was blind in the right eye.

An examination showed the following condition: The right eye protruded straight forward and its motility was limited in all directions. It resisted any attempt at replacing it in its normal position, and the pain produced by any such attempt resembled that present in orbital cellulitis and periostitis. The iris was dilated and immovable. The right eye was situated at least a quarter of an inch in advance of the left eye, but in the same horizontal plane. There was an apparent infiltration of the orbital cellular tissue, which was most marked along the floor of the orbit, and upward and outward just inside the superior orbital margin. There was a chain of enlarged glands on the right side, beginning at the pre-auricular gland and extending down along the border of the sterno cleido-mastoid muscle to the level of the thyreo-cricoid region. The patient had had repeated epistaxis for some months, together with a profuse purulent discharge from the right nostril. An examination of the nose revealed a hypertrophied and displaced inferior turbinated bone, but no visible growth in the naso-pharynx. The patient complained of a constant pain over the malar and superior maxillary bones.

A diagnosis was made of a tumor in the nasal meatus, orbit, and maxillary antrum, with the strong probability of its origin in the antrum. Two weeks later the growth along the floor of the orbit appeared at the inner canthus, where it felt like a hard though slightly yielding mass, and I urged an immediate and radical operation. The right eye was entirely blind; the ophthalmoscope showed a neuro-retinitis or papillitis in the stage of atrophy. The family consented to an operation, which was done on October 19th.

So far as could be discovered, there was no external growth on the cheek. The eyeball was enucleated in the usual manner, and the posterior part of the sclera and sheath of the optic nerve, was found to be surrounded and intimately connected with the growth in the orbit. On cutting through the optic nerve a mass of the tumor was cut through and came away with the eyeball. The floor of the orbit was found entirely absent,

except a narrow rim of bone along the orbital margin, and the antrum was filled with the growth. The conjunctiva was then cut through at the *culs-de-sac*, and, with the entire contents of the orbit, was then removed. The inner wall, roof, and outer wall of the orbit seemed to be intact and the periosteum was smooth. There did not appear to be any extension of the growth into the optic foramen or sphenoidal fissure, and these facts seemed to emphasize the probability that the tumor originated in the antrum. The communication between the antrum and nasal meatus was found much enlarged. The growth was removed from the antrum, and the cavity thoroughly washed out with bichloride solution (1 to 5,000). Part of the inner wall of the antrum and part of the nasal process of the superior maxilla were then removed, and the growth was then taken out from the nasal meatus. Small pieces of the tumor and bits of the turbinated bones were removed in this way, until it was possible to syringe freely from the antrum into the nose and pharynx. A large amount of detritus was washed out in this way, until the lower and middle meatus were entirely free. A drainage-tube was then introduced through the nose and the orbit dressed in the usual way. The bony walls of the antrum seemed to be intact, except that which separated it from the orbit, and this was entirely gone. In view of this fact, I did not deem it wise to attempt the removal of the maxillary bone, as the patient was greatly prostrated by the long operation. I told her family that the tumor would probably return and in a comparatively brief space of time, but in this I was mistaken. The patient recovered rapidly from the effects of the operation. The orbit and antrum were irrigated twice daily for a period of three weeks, but there was not at any time much discharge, and it soon changed into a slight mucous secretion. At the end of two months the periosteum lining the antrum and orbit looked smooth and normal, and the patient could breathe through the right nostril. There was no positive evidence of a return of the growth till the November following, a period of thirteen months. It then appeared in the nose from above, extending downward into the nostril and also through the enlarged opening into the antrum. She began to complain of

severe frontal headache, which probably pointed to an extension of the growth into the frontal sinus or ethmoid or both. I advised another operation, beginning in the nose, but did not urge it very strongly, as I regarded the case as hopeless from the first, and the patient herself did not wish it. I attended the case to the end. The growth gradually filled the antrum and orbit, extended into the ethmoid, broke through the orbital plate of the ethmoid into the orbit, and also filled the sphenoidal fissure. The growth in the nose was so extensive as to obliterate both nasal cavities, and for the last months of her life she breathed entirely through the mouth. She finally died from pure exhaustion without any head symptoms nearly two years, lacking a few days, after the operation. Her family would not allow an autopsy. The tumor on examination proved to be a small-cell sarcoma, very vascular, which had intimately involved the sclera and sheath of the optic nerve as well as all the orbital tissues.

Conclusions.

Tumors of the Sphenoid.—So long as a pathological process, whether it be inflammatory or a new growth, is limited to the sphenoidal antrum, the subjective symptoms are either entirely absent or there may be severe pain in the head. If the process extends to the neighboring structures, symptoms arise which point to the probability that the sphenoid bone is the seat of the disease—such as blindness due to compression of one or both optic nerves, and the visible or tangible presence of the growth in the naso-pharynx, ethmoid, orbit, or skull. The entrance of the growth into the cranial cavity may occur without any subjective symptoms, or there may be severe headache. If the progress of the growth is very rapid, meningitis or cerebral abscess will result. The ophthalmoscopic symptoms are either papillitis or atrophy of the optic nerves, due to perineuritis and pressure of the swollen nerve sheath on the optic nerve-fibers. In some cases the pressure is ex-

erted on the optic nerve in the optic canal. Tumors of the sphenoid antrum may perforate the middle fossa of the skull without causing blindness, and when blindness does occur in these cases, it is not necessarily due to pressure on the optic chiasm, for it may be unilateral. If an orbital tumor rapidly causes blindness, and the latter starts from the temporal side of the field and leaves the region of the macula lutea unaffected to the last, and if at the same time a growth appears in the naso-pharynx, it is probable that the tumor began in the sphenoid antrum.

Tumors of the Ethmoid.—A morbid growth confined within the ethmoid cells gives rise either to no symptoms at all or merely to headache, paroxysmal in character. The orbital symptoms are the same as those of tumor of the orbit. The motility of the eyeball is limited. The vision may be slightly affected, or there may be complete blindness. The visual field may not be involved. If the tumor has entered the naso-pharynx, the mouth is more or less open and the speech is nasal. Later there is loss of the sense of smell. There may be more or less continuous dropping of clear fluid from the nose even in solid tumors, owing to a communication between the upper wall or roof of the ethmoid cells and fissures at the base of the skull. There may also be orbital or palpebral emphysema and hæmorrhage from the nostrils.

Tumors of the Superior Maxilla and Maxillary Antrum.—Tumors of the maxillary antrum may cause pain in the teeth of the upper jaw, a dull pain in the region of the antrum, or in the region of distribution of the infra-orbital nerve, but not until they have attained considerable size and have more or less completely filled the antrum, the distention of the walls of the cavity causing the pain by pressure on the nerve-twigs. As the tumor grows, the walls of the antrum are gradually absorbed, and a new

thin scale of bone is developed from the periosteum. This may occur in the anterior wall, or in the orbital wall, or in the alveolar wall, and the tumor soon extends toward the nose, and causes great enlargement of the hole communicating with the nasal meatus. These nasal growths extending from the antrum are often erroneously mistaken for nasal polypi. Subsequently the diagnosis is rendered easier, either by a projection forward of the anterior wall of the antrum, or by displacement of the eyeball upward and outward, or upward and inward, by the protrusion of the floor of the orbit. A large tumor of the antrum would probably increase the breadth of the cheek and would push the nose toward the opposite side. If the tumor grows from the bone itself, the inferior orbital margin is decidedly broadened. Tumors from the antrum itself rather tend to break through into the nose, mouth, or orbit. They early involve the nasal meatus, thence extend into the spheno-maxillary and palatine fossæ and pharynx, and may finally perforate the base of the skull. They usually involve the orbit later, sometimes extending into it from the ethmoid cells, even before the floor of the orbit is perforated. In no case is it possible to diagnosticate a tumor of the maxillary antrum early in its development.

Tumors of the Naso-pharynx.—Tumors of the nasal and pterygo-palatine fossæ may enter the orbit through the infra-orbital fissure. They cause neuralgia of the infra-orbital or posterior alveolar nerves. The orbital portion of the tumor may divide into two branches, one involving the orbit and the other extending into the cranial cavity through the supra-orbital fissure. They eventually extend into all the neighboring cavities.

Finally, in the treatment of these growths, it is absolutely necessary that they should be completely extirpated early in their development, together with all the surround-

ing tissues, including the bony walls of the cavities involved. If a malignant growth has already invaded the deep bones of the face and base of the skull, including the cavities contained within them, the case may be regarded as hopeless, and while an operation may relieve the patient temporarily, it undoubtedly hastens the fatal termination.

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