

ANNALS OF OTOLOGY, RHINOLOGY AND LARYNGOLOGY

INCORPORATING THE INDEX OF OTOLARYNGOLOGY.

VOL. XXVII.

DECEMBER, 1918.

No. 4.

LXI.

MULTIPLE OSTEOMA OF THE NASAL ACCESSORY SINUSES; REPORT OF A CASE COMPLICATED BY SYPHILIS; OPERATION; AUTOPSY.

BY WILLIAM LEDLIE CULBERT, M. D.,

NEW YORK.

Although osteoma of the nasal accessory sinuses is comparatively rare, there is a considerable literature of the subject, which is, however, largely French and German. The English have reported a number of cases, but, as far as the present writer knows, have made no comprehensive study of the subject; the Americans also show this same lack of exhaustive treatment; Andrews¹ article (1887) on orbital osteoma and one by Guntzer² on nasal osteoma are the only ones that treat the subject extensively. There are also shorter articles by Knapp,^{3,4} Fridenberg,⁵ Van Wagenen,⁶ Chapman,⁷ and Barnhill,⁸ and a few other case reports.^{9,18}

The rareness of bony growth, of the orbit at least, may be judged from the fact that Andrews reported only eight cases of orbital exostosis out of almost 430,000 cases of eye disease, or 1 in 53,700; Adamük¹⁰ makes a similar statement. In

1881, Bornhaupt²⁰ reported 49 cases of osteoma, of which 23 were of the frontal sinus, 11 of the ethmoid labyrinth, 10 of the antrum of Highmore, and 5 of the ethmoid and sphenoid sinuses. Hermann Knapp³ in the same year reported 11 cases of osteoma of the frontal sinus, of which he stated that his own was the only American case on record. Haas²¹ in 1901 collected 63 cases, 21 of which were nasal. Gerber²², in 1907, reported 87 true cases of osteoma of the frontal sinus. Taranto²³ (Paris Thesis, 1901) gave 129 cases of osteoma of the nasal accessory cavities collected from the entire range of medical literature, and, up to 1914, Boenninghaus²⁴ had added 74 new cases to these 129, making a total of 203.* Since that time, about a dozen other cases have been reported, so that today we have a rough total of 215, representing all the cases in the medical literature from 1748 to the present time.

Osteomata are on record as occurring from the fourth to the seventy-fourth year. Over 50 per cent are noticed during adolescence, and about 30 per cent more before the thirtieth year of life. These growths are of three varieties, the hard or eburnated, the compact, and the spongy. Their dimensions, roughly speaking, range from that of a bean to that of a good-sized potato. They are reported as weighing from 7 to 440 gm. This latter is Hilton's²⁵ case of 14¼ ounces, an osteoma† of the sphenoid and orbit, apparently the largest human case on record. In comparison we might mention an ivory exostosis of over 16 pounds weight, from the forehead of an ox, on exhibition in the Museum of the College of Surgeons, London.²⁶ The extreme hardness attained by eburnated osteoma may be judged by the fact that in four cases that came to operation the difficulty of making any impression on the ivory-like growth with chisel, saw, or trephine was so great that in each case the operation had to be abandoned.²⁷ Grossman²⁸ removed one orbital exostosis by cross-drilling with a dentist's burr.

*These figures are cited from Chapman's⁷ report of Boenninghaus' article, second edition, 1914, as only the first edition was available to the writer. In this edition it is stated that the cases had been collected from the literature up to 1910; they numbered 198, not 148, as misprinted in Pfeiffer's article.

†Hilton's case is usually considered as an osteoma; Gerber, however, seems inclined to class it as an exostosis.

Osteomata are generally of slow growth, the development frequently covering a period of ten years and sometimes much longer before the annoyance has caused the patient to seek relief. Although these tumors are histologically benign, they are clinically malignant, since if left alone they exert pressure into the cavities of the orbit and the cranium. The only treatment is complete removal. In Boenninghaus' collection the mortality of the cases operated before 1885 was 16 per cent, and for those operated since that time, 3 per cent. According to Pfeiffer,²⁰ in the preantiseptic era the mortality was very high, but with the introduction of asepsis, improved operative technic, and recognition of the fact that an osteoma is an encapsulated tumor, the mortality has greatly decreased. Hermann Knapp³ stated that the safety and success of operations of osteoma, not only of the frontal sinus but of all the cavities of the head, lay in shelling out the tumor from within its capsule. According to him,⁴ the real element of danger occurs when there is a long prepared diseased condition of the tissues surrounding the tumor. Where this exists, the operation may be the inciting cause of meningitis or encephalitis. As chiseling through healthy bone is not dangerous, the osseous tumors which develop in comparatively healthy pneumatic cavities can be removed with safety. As a matter of fact, when death occurs it is usually from intracranial complications—meningitis or brain abscess—and generally in cases where projections of the tumor reach into the cranium. With early operation the prognosis is favorable.

Classification.—According to Gerber, the nomenclature of bone tumors in the older literature was often obscure, and a tendency existed (a) to make no distinction between exostoses (frontal bone and orbit) and true osteomata of the sinuses; and (b) to group together all the osteomata of the ethmoid and frontal region. Gerber has classed as exostoses the cases of Lucas, Keate, Cooper (and questioned those of Hilton and Hoppe), which are elsewhere regarded as osteomata. It is also interesting that in his attempt to obtain a correct classification of osteomata in imperfectly reported cases, Gerber located the growth according to the dislocation of the ocular globe; when the protrusion of the eye is forwards only, he classifies the osteoma as sphenoidal or orbital; when the pro-

trusion is exclusively outwards, tumor of the ethmoid is inferred; where the globe is directed upwards, the maxillary sinus is involved; while a propulsion forwards, outwards, and downwards is pathognomonic for tumors of the frontal sinus. Knapp states that the onward march of an osteoma growing in the frontal sinus must push the globe in these three directions. The X-ray is today our best means of information as to the form, location and size of the tumor.

Growth and Origin.—Osteomata may involve one sinus or cavity only, or they may develop symmetrically, involving corresponding sinuses. They may be multiple distinctive growths with apparently different foci, or they may send out projections from a single point of origin. This point of origin may be the frontal, lacrimal, or nasal bones, the nasal process of the superior maxilla, the turbinates, etc. Of Bornhaupt's 49 cases, 34 originated in the ethmoid. Gerber gives the proportion of tumors arising in the ethmoid as 12 to 8 to those arising in the frontal sinus. According to Güntzer, "in most instances the point of origin is difficult to demonstrate, the weak connection with the nasal skeleton is so easily destroyed in operative manipulation, or, by pressure, atrophy or pus formation, the pedicle may be destroyed and the osteoma become sessile or entirely free."

Histopathic Origin.—Osteomata have been variously described as originating from the diploe of the frontal bone (Virchow³⁰), as ossifications of the Schneiderian membrane lining the nasal cavities (Dolbeau³¹), as of periosteal origin (Sappey, see Dolbeau), as enchondroma (Rokitansky³²), or remnants of fetal cartilage which later ossify—Arnold³³ and Tillmans³⁴ have elaborate theories to this effect—as originating from connective tissue rudiments (Pfeiffer), as ossifications of mucous polypi (Cloquet), as developments of the small exostoses, osteophytes, or hyperostoses of the frontal sinuses (Gerber). Cruveilhier³⁵, 1856, believed that they develop in the interior of the bone in such a manner as to push the peripheral layer of bone before them like a capsule. The question is still open.

Sinusitis as a Complication.—Before discussing the theories of causation of osteoma of the nasal accessory cavities, it would perhaps be well to consider the complications frequent-

ly accompanying these tumors. The proportion of osteoma with and without complication is not known. Hucklenbroich³⁶ in 1905 found six out of sixteen (37.5 per cent) of the more recent cases complicated by sinusitis. These are the cases of Mitvalsky,³⁷ Coppez³⁸ (two cases), Tauber,³⁹ Zimmermann,⁴⁰ and Witzheller.⁴¹ The present writer has also noted eight others, including his own, Knapp,⁴² Satteler,¹³ Pfeiffer, Gerber, Van Wagenen, and Chapman. Mitvalsky (p. 613) states that the granulations and the polyps of the mucous of the frontal sinus as auxiliaries of osteoma of the nasal accessory cavities have long been known; and that Virchow, who rejected Cloquet's idea that the osteoma developed through the ossification of these polyps, neglected the question whether (a) the affection of the frontal sinus precedes the osteoma and is the determining cause of its evolution, or (b) whether the affection of the sinus is merely the result of the presence of the growth in course of evolution. Coppez considers that the permeability of the nasofrontal canal has to do with the presence or not of sinusitis. When the canal is closed, the products of mucosecretion have no means of evacuation; they stagnate in the depths of the sinus, ferment and decompose there, with inflammation and suppuration of the sinuses as inevitable consequences. He assumes that the presence of the osteoma is responsible for an edematous mucosa which forms folds and obstructs the opening of the canal, together with the progressively growing osteoma.

The view that complications in the frontal sinus occurring with osteoma were inevitably direct results of the obstructing growth has been generally accepted. Gerber is apparently the first writer to consider that a sinusitis might antedate the growth of an osteoma and be a causal factor in its development. According to him, latent torpid sinusitis producing inflammatory irritations is comparatively frequent in the frontal sinuses. The irritations thus produced, which are capable of causing ossifications of bone or periosteum, exert their maximum influence during the period of formation of bone and development of the frontal sinuses, thus explaining the youthful age of the majority of the cases. Gerber states (1907) that up to recent times there has reigned a false conception of the inflammatory modifications of the frontal sin-

uses, which are often due to conditions left by the many violent inflammations of the nasal fossæ. Although these inflammations of the sinuses generally disappear without leaving any traces, they may, however, persist and become true empyemas with more or less involvement of the bony walls of the sinus in the morbid process. The frontal bone itself has been affected by such lesions far more often than is generally credited. Furthermore, it is well known that such symptoms may survive in individuals enjoying excellent health.

The case reported by Chapman of frontal osteoma in a woman of fifty-two years, who had suffered from headaches for three years following grippe, seems to be illustrative of Gerber's argument. Doubtless, in this case, the inflammatory condition left by grippe either caused an osteomatous growth to develop or else speedily accelerated a latent growth of such small size that it had given no indications of its presence up to the age of fifty-two years. In one of his cases, Hermann Knapp⁴ wrote that a chronic inflammation in the pneumatic cavities of the upper part of the face had led to a distension of the left frontal sinus and rendered its osseous wall congested and porous (ostitis), with beginning necrosis. Finally, the youthful age at which sinuitis usually develops should be kept in mind.

Symptoms Accompanying Osteoma.—A considerable number of cases of osteoma are reported as being absolutely without symptoms except a greater or less displacement of the eye or facial disfigurement. Curiously, this lack of symptoms seems to be independent of the size of the tumor; large growths have been removed where the cosmetic effect was the patient's only interest. There is, however, a whole range of symptoms which frequently accompany osteoma of the nasal accessory cavities; they include nasal obstruction, catarrh, anosmia, difficult respiration, otorrhea, middle ear deafness, etc., and are regarded almost exclusively as pressure symptoms due to the increasing injury of the surrounding parts by the morbid growth. However, there are certain cases with a long history of illnesses, where the probability that an inflammation of the mucous membrane antedated the osteomatous growth is very strong; such cases make one wonder

if an original infection of the tissues lining the nasal cavities was not a causal factor in the production of the osteoma, which in turn added pressure and obstruction to the original trouble.

Osteoma in Cases of Constitutional Maladies.—On this subject the literature gives very little information; a lack of adequate examination of the patient renders many reports unsatisfactory. A few interesting cases are, however, reported: Van Wagenen had a case of frontal osteoma in a patient who previously had suffered from frambesia, a tropical disease caused by a spirillum similar to that of syphilis; he regarded the osteoma as secondary to the infection. Leonte⁴³ gave an etiology of secondary syphilis in a case of nasal osteoma in a man of fifty-four years who had contracted syphilis at twenty-six, followed by secondary syphilis, with much coryza and articular rheumatism at forty. There was no other cause. Gerber also reports an etiology of syphilis in one of his cases of frontal osteoma. Dolbeau reported a case of frontal osteoma in a man of twenty-one years, with a long history of illnesses including typhoid and blennorrhea. There are other similar reports. Many of the former writers have stated that there was no question of syphilis in their cases, but we might pertinently ask, "How did they know?" The fact that antisyphilitic treatment did not decrease the osteomatous growth is no proof of the absence of specific disease.

Etiology.—The writer has just considered briefly certain conditions possibly contributing to the development of osteoma before reviewing still more briefly the many and confusing hypotheses furnished by the literature. Historically, there are three general theories: (a) The first and oldest theory, that of trauma as a primary cause, is obviously the result of the fact that a number of the earlier cases were complicated by external injuries—falls or blows. At the present time traumatism is generally regarded as a contributory rather than an essential cause, since many cases have been observed where there had been no trauma, and also because of the nature of the growth, which may be symmetrical or multiple. However, a number of fairly late writers, Dubar,⁴⁴ Taranto, and Miodowski,⁴⁵ still are inclined to believe that osteomatous growths can be traced to external

traumatism. (b) The second and most widely held theory is that of an embryonic genesis—an anomaly of growth, a congenital fault—which, as previously stated, various writers have located in bone, periosteum, fetal remnants, etc. Given certain circumstances—a perfectly healthy individual, without constitutional disease, without sinusitis or lesions of the nasal fossæ, with no history of traumatism; at a youthful age, particularly at adolescence, when the growth in the frontal region is greatly accelerated—and this theory affords a satisfactory explanation of the development of osteoma. Under such circumstances, Citelli⁴⁶ attributes these growths to an ontogenetic or morphologic lack of balance in the rapidly growing osseous elements, aided by a more or less congenital predisposition. (c) The third theory is Gerber's intermediary theory, according to which a mechanical cause—external traumatism—or an inflammatory process; sinusitis or lesions of the mucous membrane of the nasal accessory cavities—may provoke or stimulate otherwise quiescent inherent faults of development to active growth.

In conclusion, the writer summarizes his own beliefs on this subject of etiology as follows:

(a) In cases of osteoma of the nasal accessory cavities there is in all probability an original fault or tendency, congenital in the individual.*

(b) Such faults or tendencies, when not irritated to activity, often probably remain quiescent and never develop.

(c) Conditions likely to activate osteomatous growths are:

1. The great neoformative activity in the frontal regions during adolescence.
2. External traumatism.
3. Endogenous irritations: inflammations and infections of

*There is a possibility that abnormalities of bony growth—osteoma, exostosis—occur in a certain type of person; one possibly in whom the organs of internal secretion, pituitary, thyroid, adrenals, cannot maintain a proper balance. The writer was interested to note in his two cases of osteoma—the one reported here and another under observation not yet operated upon—that one, a man of forty-three years, of great physical vitality, had the mentality almost of a child, while the other, a girl of eleven years (referred to me through the courtesy of Dr. Martin Cohen), had the physical development of a mature woman.

the nasal accessory cavities—i. e., the sequelæ of grippe, influenza, and the whole range of nasopharyngeal affections. These conditions are probably the most frequent cause of trouble.

4. Constitutional maladies, particularly syphilis, and possibly other infectious diseases.

5. Above all, combinations of these different causes; of the effect of such combination, the literature furnishes many examples.

REPORT OF A CASE.

In July, 1917, Dr. C. W. Cutler referred a case to me, in which a hard mass growing outwards, forwards, and downwards, apparently from the junction of the frontal and ethmoid, had produced a marked displacement of the right eye and partial closure of the lumen of the right nostril. Dr. Cutler's report read: Right eye separated 41 mm. from median line; left eye, 32 mm. Right eye displaced $3\frac{1}{2}$ mm. outwards, $3\frac{1}{4}$ mm. downwards. Moderate exophthalmos, no diplopia, motility apparently normal. Vision in right eye, 20/20; in left, 20/15. A tentative diagnosis of osteoma of the right orbit was made. The first X-ray plates showed a mass involving both frontal sinuses and the ethmoid, and protruding into the right orbit, with dislocation of the right middle turbinate toward the median line and consequent partial occlusion of the right nasal cavity.

The patient, an Italian, a chauffeur, aged forty-three years, stated that for the past seven years he had noticed a hard mass growing in the inner angle of the right eye. Other than this growth, he was enjoying the most robust health, and was a man of extraordinary vigor and muscular strength, with no history of illnesses. Nevertheless, a Wassermann taken as a matter of routine at the time of examination showed 4 plus. Consequently, several injections of oxycyanate of mercury were given, not with the hope of reducing the growth, but of assisting the healing of the tissues after operation. The only treatment for the osteoma was surgical.

First Operation, July 25, 1917 (Dr. C. W. Cutler present). —Procedure: Killian incision on right side; elevation of scalp; entrance into frontal. The outer table was partly ab-

sorbed and quite thin; immediately underlying it was an enormous, irregularly shaped, eburnated osteoma, which because of its extensive size was more or less flattened from before backwards. It filled the unusually deep right frontal sinus anteroposteriorly and extended for a considerable distance into the left, with complete destruction of the septum. The patient's frontals were enormous, and that part of the tumor lying in them alone was larger than the average frontal sinuses.

In order to approach the growth from above, a transverse incision directed outwards and upwards from the original incision was made above the left eyebrow, and the outer table of frontal bone was removed over the left frontal sinus. When the osteoma was entirely uncovered, it was apparent that the growth came from or extended into the ethmoid and also into the right orbit. Consequently it was furthermore apparent that it would be impossible to get it out without removing the inner two-thirds of the right supraorbital ridge, which was accordingly done. When the osteoma was thus uncovered so that its outlines could be clearly seen, we found that we could not enucleate or even rock it, and it was necessary to bite it out piecemeal with large rongeurs, with the expenditure of great force. In removing the tumor from the frontal sinuses, we discovered that it had eroded through the inner table of the skull; and the dura, which was very thin and apparently adherent, was torn in manipulation, allowing the escape of cerebrospinal fluid. The wound was covered with iodin gauze, and the operation proceeded.

Pus was encountered in the recesses of the frontal sinuses beyond the margins of the tumor; of this pus, several cultures were taken, which later proved sterile. When the pus and the granulation tissue were cleaned away, the tumor was bitten down to the top of the orbit, and a portion as large as a grape shelled out of the orbit. The osteoma in the orbit seemed to be a continuation downwards from the solid frontal growth and also to be in close articulation with the osteoma of the ethmoid.

After we had removed this portion of the eburnated tumor, we noticed that the bone at the base of the frontal sinus and at the lower part of the inner table was of unhealthy appear-

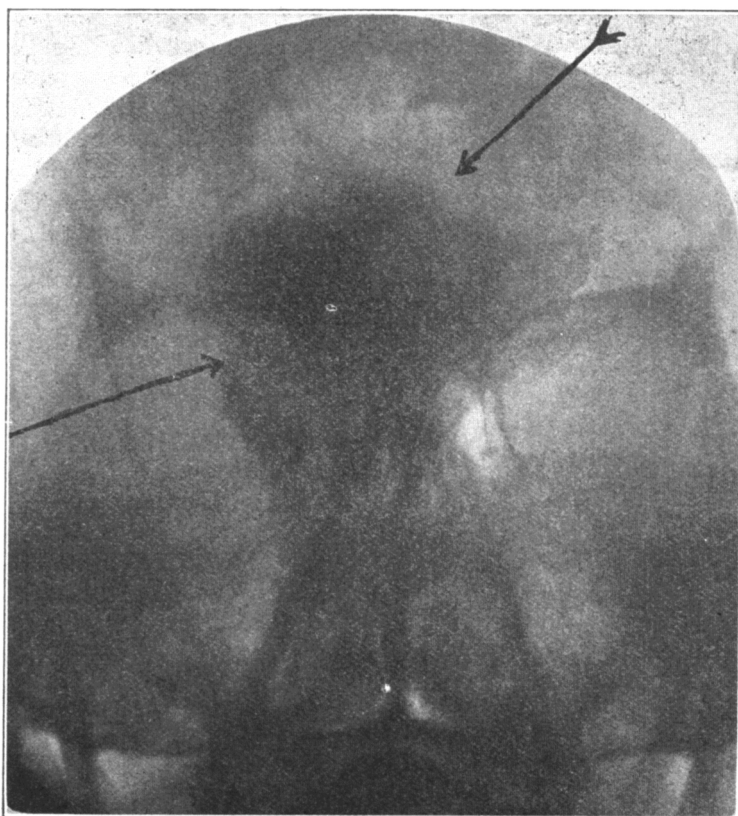


Plate I.—Anteroposterior view of osteoma before first operation, showing osteoma in frontals, ethmoid, and encroaching into right orbit.

ance—fibrous or cancellous in character. Although Dr. Guntzer states that in the hard variety of osteoma, the place of attachment is usually soft or cancellous; nevertheless, in this particular case, I regret that I did not have some of this bone examined for spirochetæ.

The first operation was concluded without opening the nose, since, because of the torn dura, there was fear of cerebral infection. The frontal sinus was packed lightly and the wound sewed up, leaving an opening for drainage near the median line at the inner extremity of the supraorbital ridge, as no drainage could be established through the nose. The patient ran the usual postoperative temperature for three days and proceeded to a slow and uneventful recovery. In September, Dr. Cutler stated that the displacement of the eye outward was slightly increased. Vision, 20/30. Later, in December, Dr. Cutler reported vision 20/20; fundus normal; lateral displacement of right eye same as left, namely, 32 mm. Very slight displacement, if any, downwards. Pupils always equal; normal reaction. Occasional complaint of diplopia in distant vision, but not annoying. Return of eye to normal position and function.

During convalescence the patient received various active antispecific treatments—intravenous injections of salvarsan, injections of mercuric salicylate, and oxycyanate, as well as potassium iodid. Later, he received antispecific treatment at Hot Springs, Ark., where, upon his arrival, the Wassermann was said to have been 1 plus, but on his return to New York, three months later, in December, a second Wassermann again showed 4 plus. Further X-rays, including a stereoscopic pair, were taken at the Manhattan Eye, Ear and Throat Hospital, and from these latter it was revealed for the first time that the bony growth extended into the cranial cavity. Realizing that it would be impossible to remove all of the growth, I consulted with various colleagues as to the advisability of further operative procedure. It was decided to be wise and justifiable to remove as much as possible of the growth from the ethmoid and establish free drainage from the frontal into the nose; this decision was strengthened by the amount of pus constantly present.



Plate II.—Lateral view before first operation.

Second Operation, January 8, 1918.—Line of old incision reopened and extremities of two former lateral incisions extended. Scalp retracted, frontal sinuses exposed; very thorough cleaning out of pus. The opening into the dura had granulated over and was carefully avoided. With a Killian chisel an opening was made through the lacrimal bone in order to enter the ethmoid, but when the lacrimal bone was removed the hard eburnated tumor presented, and no progress could be made towards the ethmoid. Therefore, the right middle turbinate was removed as a whole intranasally. During this removal two small nuggets of ivory-like bone dropped out of the mucosa of the middle turbinate body. The way was now cleared for entrance into the ethmoid, which was the seat of several medium sized osteomata, which formed a sort of interlocking combination with closely articulating faces. After these were removed there yet remained one more flat, wedge-shaped growth—hard and glistening—on the right side of the ethmoid which, from its solidity and impingement, as well as the X-ray findings, I realized extended into the brain; this piece was left in, for fear of trauma to the cribriform plate and the meninges. Finally, there was cleaned out from the cancellous tissue a little fistula, containing pus, which lay in the median line just above a line connecting the supraorbital ridges. Examined with a probe, the fistula seemed to have a soft, resilient base, which, when the lumen of the fistula was enlarged and the pus cleaned away, proved to be the longitudinal sinus.

As free drainage had been established from the frontal sinus into the nose through the enlarged infundibulum, the wound was sewed up, after a large cigarette drain had been placed through the infundibulum and out through the nose. In addition to this, a cigarette drain was also placed at the outer extremity of each of the frontal sinuses, to take care of the numerous and extensive recesses requiring drainage.

Several stitches of the wound near the inner canthus of the eye unfortunately did not hold, and because of the pus tore through the tissue. Later, this opening was utilized, together with those of the extreme lateral ends of the sinuses, to wash through the frontal sinuses with Dakin's solution, and yet later to instill dichloramin-T.

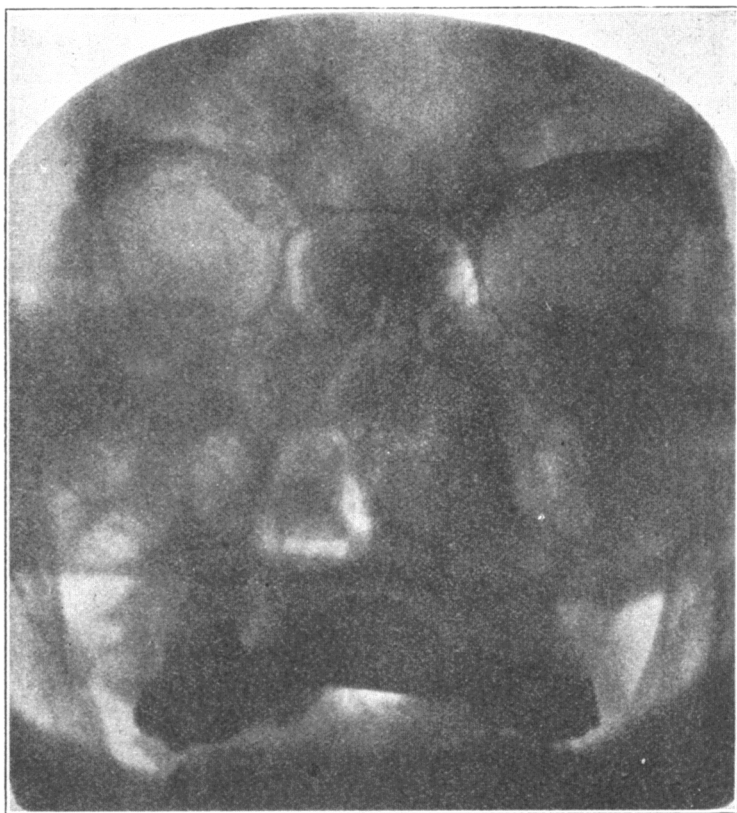


Plate III.—Anteroposterior view after first operation, showing osteoma removed from right orbit and frontals, but still present in ethmoid.

The patient recovered from the operation and was in good condition; he was bright, cheerful, talkative, enjoyed going out to the movies, etc. It was impossible, however, to eliminate entirely the pus discharge from the wound, even by the frequent use of dichloramin-T, with which Dr. E. K. Dunham kindly furnished me, although this did cut it down markedly. On February 21st, for the first time, the patient complained of severe headache which kept him awake at night. Medication gave little or no relief. He became progressively worse and more apathetic. A white cell and differential blood count made at this time showed 21,600 leucocytes, with 78 per cent polynuclears; a later count showed 16,000 leucocytes, with 70 per cent polynuclears.

On the morning of March 2d, while sitting up, he suddenly fell over unconscious, and after this he did not talk again. He could be roused at times, but answered questions only by shaking his head, and at noon of the next day, March 3d, he died.

The autopsy was performed March 4th, at 1 p. m., by Dr. J. G. Dwyer. His report follows: Usual postmortem technic. Skull—Removed; on both sides of vertex, in both parietal bones, there was marked rarefying osteitis which had almost penetrated the skull on both sides. Dura slightly congested, but otherwise normal except in region corresponding to above bony lesions, where marked infiltration of dura took place with formation of granulation tissue.

Brain Examined in Situ.—Marked loss of tissue of both frontal lobes, especially on anterior under surfaces, where large brain abscesses with degeneration of all surrounding tissue occurred. About three ounces of pus evacuated from right lobe and two ounces from left. Cultures taken and proved sterile after six days. General appearance of brain as a whole suggestive of "wet brain."

Bone.—Leading from site of the operations to right side was a marked infiltration of the posterior inferior wall of the frontal sinus with newly formed bony tissue.* This new tissue had formed spicules, some of which had penetrated the dura and the frontal lobe, and led to the brain abscess, which

*At the base of the cancellous tissue.

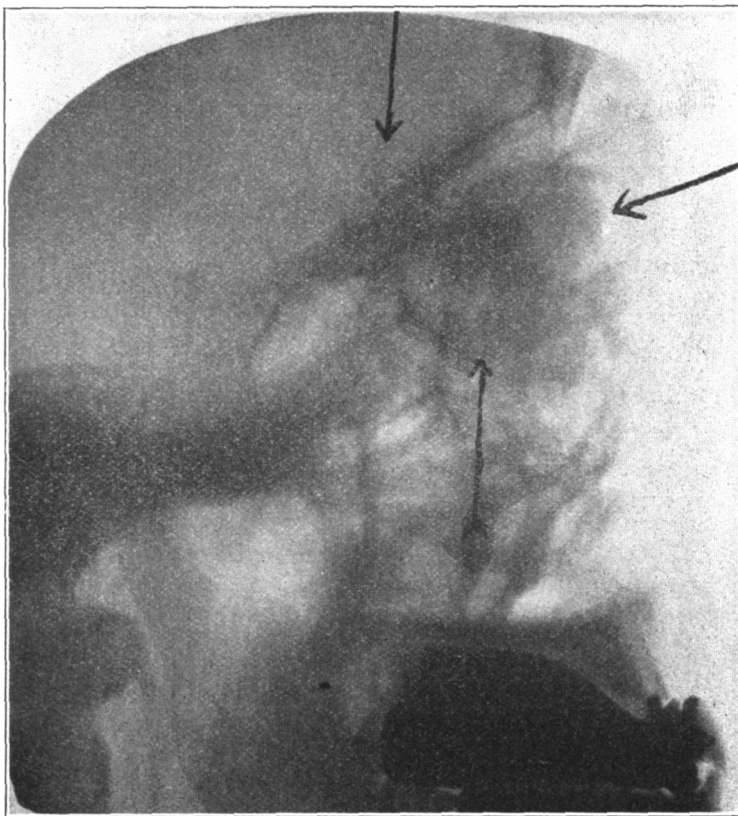


Plate IV.—Lateral view after first operation. Arrow at top indicates upward growth of osteoma into brain.

was probably secondary in character to the bone invasion. A similar but less extensive condition prevailed on the left side. The crista Galli, left superior turbinate, and surrounding bone had been replaced by newly formed hard osteomatous tissue. Antra and other parts of head negative except for obliterating endarteritis. No invasion of orbits per se.

At my special request, Dr. Dwyer had numerous sections of the brain, dura, and portions of the osteomatous bone prepared and examined to see if spirochetæ could be detected. He returned the following histologic report:

Large Mass of Osteoma.—Typical appearance of osteoma, with exception of marked fibrous tissue infiltration within the cortex, separating the osteomatous tissue proper. This is unusual in osteoma of the primary type and leads to the belief that the osteoma may be secondary to or caused by syphilis. Dura over frontal lobes, in contact with rarefied parietal bones, shows a typical syphilitic process with giant cells and marked cellular infiltration. Turbinate bones: The superior on left side markedly hardened, osteomatous in character, shows same infiltrating processes as those of large mass described above. Middle turbinate on right side: process here is less extensive, consisting simply of a round cell infiltration of a small part of the turbinate. (As previously stated, two small osteomatous nuggets dropped out of the mucosa of the right middle turbinate during operation.) Histologically, the osteoma as a whole is multiple, as the different parts affected are not connected with each other. It is a question whether there is a primary osteomatous condition, complicated by syphilis, or an osteomatous condition secondary to syphilis.

SUMMARY.

1. The growth just described was a multiple eburnated osteoma involving the frontals, ethmoid, right orbit, middle and superior turbinates and crista Galli, and protruding into the cranial cavity. The thickness of the cortex, judged from measurements of one or two of the larger pieces removed, varied from 2 to 12 mm. As this osteoma was so large and involved so many sinuses, it was impossible to remove it as a whole, so that no exact size, shape, measurements or weight could be obtained; consequently, the size must be determined

as far as possible by measurements of the shadows in the X-ray plates. In these, Dr. F. M. Law gives the following dimensions: Transverse diameter in the frontal region, 70 mm.; anteroposterior diameter, in the ethmoid region, 40 mm.; in the frontal region, 20 mm. Vertical diameter, 60 mm. A later X-ray gave the measurements from the cribriform plate, downwards and forwards, 45 mm. Within the cranial cavity, above the cribriform plate, the shadow seemed to extent upwards about 20 mm.

2. In the frontal sinuses and the right orbit, this osteoma was one solid, continuous growth; but in the ethmoid region it was composed of several nuggets, some of whose faces articulated so perfectly that, literally speaking, a hair could not have passed between them. They resembled the tight overlapping of peanuts in a shell. (In a similar growth, Tauber uses a cauliflower as a comparison.) In the operation, the result of this articulation was that when a part of one face was bitten off, the combination was unlocked with liberation of the remainder of that portion. These peculiarities of growth seem proof—to the author, at least—that this multiple osteoma had several foci, which were, possibly, the frontal sinus, the junction of the frontal and ethmoid, the ethmoid, and the turbinates—and that all these different simultaneous growths were finally jammed and moulded together.

3. Etiology.—This growth certainly covered a period of ten years and probably a much longer one. In a histologic report which Dr. Jonathan Wright* was kind enough to make on slides of the osteomatous bone from the first operation, he states that the Haversian canals were markedly enlarged with a proliferation in them of an embryonic connective tissue or perhaps the remnants of the processes of the giant bone cells. It is probable that this osteoma found its origin, as many authors believe, in some embryonic growth-fault in the fronto-ethmoidal region. But one may ask, what irritation caused so excessive a production and formation? It is impossible to

*Dr. Wright's opinion was given on slides from sections of the first operation, before the autopsy report had been made. He inclined to the opinion that the growth was an osteosarcoma, without, however, ruling out the possibility of osteoma with syphilis.

determine whether the sinusitis of many years' standing had antedated the osteoma and acted as a stimulant for its growth, although that is a distinct possibility. It may be said, however, with very great certainty, that the osteomatous condition, if not secondary to the syphilis, was greatly aggravated by the acquisition of syphilis.

4. The necessity for early treatment cannot be too strongly stated. Reports of similar cases show that so good a subject as the patient had every chance of recovery if the operation had been performed before the growth had invaded the cranium.

5. Although at autopsy an abscess was found in each frontal lobe, no sign or symptom referable to them had presented at any time during the patient's life with the possible exception of the last few days.

6. This case, in which the patient enjoyed extraordinarily good health, nevertheless revealed sinusitis and syphilis, both of long duration. As the literature shows a good many cases in which, because of the patient's excellent health, no Wassermann was taken, the present writer would like to urge that no means of examination be left untried for patients in whom an osteoma of the nasal accessory sinuses is detected.

BIBLIOGRAPHY.

1. Andrews, J. A.: Successful Removal of Two Osteomata of the Orbit; One Originating in the Frontal, the Other in the Ethmoid Cells, *Med. Rec.*, 1887, XXXII, 261.
2. Guntzer, J. H.: Nasal Osteoma; Report of Case; Operation, *Med. Rec.*, 1910, LXXVIII, 12.
3. Knapp, H.: The Exostoses of the Frontal Sinus, *Trans. Med. Soc. St. N. Y.*, 1881, 244.
4. Knapp: A Case of Ivory Exostosis of the Ethmoid Cells, *Arch. Otol.*, 1884, XIII, 51.
5. Fridenberg, P.: Orbital Osteoma of Ethmoid Origin; Perforation of Orbital Roof and Exposure of Frontal Lobe—Operation—Recovery, *Trans. Am. Ophth. Soc.*, 1903, X, 83.
6. Van Wagenen, C. D.: Postoperative Double Frontal Sinuitis, Extensive Osteoma of Frontal and Nasal Bones and Orbital Fossa, with Superimposed Lipoma, Causal Factor, Frambesia (Yaws), *Laryngoscope*, 1911, XXI, 643.
7. Chapman, V. A.: Osteoma of the Frontal Sinus, *Jr. Mich. St. Med. Soc.*, 1916, XV, 18.
8. Barnhill, J. F.: Unusual Case of Large Osteoma of Frontal Sinus, with Complications, read at the Cong. Am. Laryngol. Ass., 1918. (To be published shortly.)

9. Mott, H. B.: Case of Exostosis Occupying the Orbit and Nasal Cavity, *Am. J. M. Sc.*, 1857, XXXIII, 35.
10. Jackson, E.: Osteoma of the Orbit. *Jr. Am. M. Ass.*, 1892, XIX, 299.
11. Lewis, F. N.: Osteoma of the Orbit, *Med. Rec.*, 1893, XLIII, 654.
12. Pooley, T. R.: The Removal of a Large Exostosis of the Orbit, *Trans. Am. Ophth. Soc.*, 1890, V, 611.
13. Sattler, R.: Ivory Exostoses of the Orbit, *Trans. Am. Ophth. Soc.*, 1896, VII, 553.
- Sattler, R.: Supplementary Report, *ibid.*, 1897, VIII, 70.
- Exstosis of the Orbit and Frontal Sinus, *Cincin. Lancet-Clinic*, 1897, XXXVIII, 137. vX
14. Sattler, R.: A Cast of Unilateral Proptosis, etc., *Arch. Ophth.*, 1918, XLVI, 168.
15. Norris, W. F.: An Ivory Exostosis of the Orbit, *Tr. Am. Ophth. Soc.*, 1897, VIII, 67.
16. Veasey, C. A.: Unusually Large Osteoma of Frontal, Ethmoidal and Sphenoidal Sinuses Involving Orbit and Anterior Cerebral Fossa, *Ann. Ophth.*, 1916, XXV, 699.
17. Probert, C. C.: Osteoma of the Frontal Sinus, *Jr. Mich. St. Med. Soc.*, 1916 XV, 304.
18. Coffin, L. A.: Osteoma of the Ethmoid, *Laryngoscope*, 1917, XXVII, 525.
19. Adamük: Three cases of Bony Orbital Tumors, *Arch. Ophth.*, 1890, XIX, 243.
20. Bornhaupt, T.: Ein Fall von linksseitigem Stirnhöhlen Osteom, *Arch. klin. Chir.*, 1881, XXVI, 589.
21. Haas, E.: Ueber die Osteome der Nasenhöhle, *Beitr. klin. Chir.*, 1901, XXXI, 139.
22. Gerber, P. H.: Les Ostéomes du sinus frontal, *Arch. internat. de lar.-otol.-rhinol.*, 1907, XXIII, 17.
23. Taranto, I. M. de: Les Ostéomes de l'orbite (Thesis), Paris, 1901.
24. Boenninghaus: Die Operationen an den Nebenhöhlen der Nase, *Handb. d. spez. Chir. d. Ohres u. oberen Luftwege*, 2nd Ed. Wursburg, 1914, III, 234.
25. Hilton: Case of Large Tumor in Face, *Guy's Hosp. Reports*, Lond., 1836, I, 493.
26. Paget, Sir J.: *Lectures on Surgical Pathology*, Lond., 1853, II, 234.
27. Tweedy, J.: On a Case of Large Orbital and Intracranial Ivory Exostosis, *Royal Lond. Ophth. Hosp. Reports*, 1880-82, XIII, 303.
28. Grossman, K.: An Ivory Exostosis of the Orbit Removed by Drilling, *Ophthal. Rev.*, 1887, VI, 341.
29. Pfeiffer, W.: Ein Fall von Osteome und Mukokele des Sinus frontales mit Perforation der Zembralenwand, *Zeit. Ohrenh.*, 1912, LXII, 223.
30. Virchow: *Die Krankhaften Geschwülste*, Berlin, 1864-65, II.
31. Dolbeau: Mémoire sur les Exostoses du sinus frontal, Paris, 1871.
32. Rokitsky, C.: *Handb. d. path. Anat.*, Wien, 1844, II, 210.

33. Arnold, J.: Zwei Osteome der Stirnhöhlen Virchow's Arch. path. Anat., 1873, LVII, 145.
34. Tillmans, H.: Ueber todte Osteome der Nasen und Stirnhöhle, Arch. klin. Chir., 1885, XXXII, 677.
35. Cruveilhier, J.: *Traité d'anatomie pathologique*, Paris, 1856, III, 871.
36. Hucklenbroich, P.: Über einen Fall von Osteom nebst Mucocele der Stirnhöhle, Inag.-diss., Freiburg, 1905.
37. Mitvalsky: Recherches sur les tumeurs osseuses de la région orbitaire, Arch. d'opht., 1894, XIV, 593.
38. Coppez, H.: Six cas d'ostéomes du sinus frontal. Arch. d'opht., 1895, XV, 279.
39. Tauber A. S.: Über Stirnhöhlenosteome, chirurgia, 1898, III, 41 (Moscow). Ref. Centralbl. Chir., 1898, XXV, 775.
40. Zimmerman, H.: Ein Osteom des Sinus frontalis, Deut. Zeit. Chir., 1900, LVII, 354.
41. Witzheller J.: Über einen Fall von spongiösem Osteom der Stirnbeinhöhle, Inag.-diss., Greifswald, 1900.
42. Knapp, H.: Beschreibung eines Fall von elfenbeiner Orbitalexostose, Arch. Ophthal., 1861, VIII, 239.
43. Leonte: Osteom eburnat al fose, nasale drepte, Spitalul, Bucuresci, 1893, XIII, 81.
44. Dubar, E.: Des Ostéomes des fosses nasales et des sinus voisins (Thesis), Paris, 1900.
45. Miodowski, F.: Knöcheron Orbital Tumoren. Inag.-diss., Breslau, 1900.
46. Citelli, S.: Gros ostéome primitif du sinus frontal. Ann. d. mal. d'oreille, du larynx, etc., 1918, XXXIX, 483.