XLIII.

A STUDY OF ONE HUNDRED CASES OF SUSPECTED CHRONIC NASAL ACCESSORY SINUS DISEASE WITH A REPORT OF THE X-RAY FINDINGS.*

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In going over the literature of the radiography of the nasal accessory sinuses I have been impressed with the many diverse opinions and reports expressed concerning the accuracy and value of the procedure. It is with the hope of contributing somewhat to the clarification of the results to be expected that I report this series of cases.

Roentgenography of the nasal accessory sinuses is essentially a shadow transposition of the differential densities of the bones of the skull as modified by certain diseases or conditions, such as—

1. Age—In infancy there are numerous modifying conditions—for example, size, shape, development, etc., of the sinuses and bones of the skull.
2. Sex—Men are apt to have thicker or heavier bones than women.
3. Disease—Such as loss of lime salts.
4. Thickness of bone of face and skull. This may be a localized thickening, an unilateral or bilateral thickening.
5. Asymmetry of the sinuses or bones of the skull.
6. Altered mucous membrane. This may take the form of an excessive thickening due either to infection or as a post-operative result, or the alteration of the mucous membrane may be an extreme thinning or atrophy.
7. Inflammation or suppuration within the sinuses.
8. Inflammation or suppuration adjacent to the sinuses.

*Read before the Chicago Laryngological and Otological Society, March 3, 1919.

9. Tumor formation involving the region of the sinuses or the sinuses itself.

10. Angle of exposure—Various dense structures, such as the petrous portion of the temporal,¹ the vertebræ, or the base of the skull may be projected in line with the sinuses, obscuring and interfering with the proper reading of the plates.

In view of the above modifying conditions, it is illogical to assume that a diagnosis can be made from the plates alone. A secondary place perhaps should be given to the X-ray, and the main reliance should be placed on clinical means. Caldwell² was the first to show that the contents of a sinus, whether pus, normal salt solution or water, offer about the same degree of obstruction to the X-ray. Beebe³ arrived at the same conclusion after injecting the sinuses with liquids of varying densities from water to thick pus. Differentiating between a pus filled sinus and a neoplasm is not always easy, although the neoplasm usually involves other structures as well, which somewhat simplifies the diagnosis.

The angle or plane of exposure is important and should be governed by the sinus or sinuses suspected. The custom largely prevalent in the past and at present is to have one sagittal (posterior anterior) view and one lateral view. When the expense is to be considered, this perhaps will give as much general information as any other two views, but the objection to these is that in the lateral view the ethmoids and sphenoids are superimposed upon the opposite sides, and their outlines are confused or blurred. In the posterior anterior views the ethmoids and sphenoids are superimposed, and an intelligible reading frequently rendered impossible.

An excellent procedure, in my opinion, when general information concerning all the sinuses is desired, is to have three views, one posterior anterior (Caldwell) and two obliques (Rhese). In the posterior anterior view the tip of the nose and the forehead touch the plate. The rays are passed from near the occiput at right angles to the plate. The right and left oblique views are taken as first described by Rhese.⁴ In the oblique position the object is to project the sphenoids and the posterior ethmoids through the orbit. To accomplish this the tip of the nose, the brim of the orbit and the malar bone touch the plate and the rays enter the parietal

region about two inches posterior and one and one-half inches superior to the external auditory meatus. This should project the optic foramen near the center of the orbit. To the median side and below is the sphenoid sinus. Above the rim of the orbit is the frontal sinus. The ethmoids occupy the space below the frontal and extending posteriorly to the sphenoid.

For the frontal sinus alone the Caldwell position is ideal. If operative interference is anticipated this position should be supplemented with a lateral view, so that information concerning the depth of the sinus can be obtained.

For the ethmoids, as stated above, I prefer the oblique position of Rhese. Both sides should be taken for comparison.

If a picture of the antrums alone is wanted, an excellent view is obtained from the extended chin position first described by Waters⁵ and Waldron⁶ in which the petrous portion of the mastoid falls below the floor of the antrum. This position is obtained by having the chin of the patient touch the plate and the tip of the nose from one to one and one-half cm. from the plate. In a concave face an increase of one-half cm. in the distance of the nose from the plate is required. This position gives a slight distortion of the frontal sinuses, due to the distance from the plate. The posterior ethmoid cells are shown below the anterior group. This can be demonstrated by means of bismuth paste or metal clips.

A satisfactory view of the sphenoid is sometimes hard to get. Pfeiffer⁷ has described a method whereby the two sphenoids are shown side by side. The patient extends the chin forward over the plate, and the central rays pass vertically through the head in the median line at a point 2 c. m. in front of the external auditory canal. Bowen⁸ places the plate on top of the extended head and passes the rays from below up. A combination of lateral, oblique and vertical views will usually give enough information to greatly assist in the diagnosis.

Beebe³ calls attention to the fact that the blurring or hazing of the sinus outline is of more diagnostic import than the shadow cast. He bases his objection to the roentgenogram taken stereoscopically on this fact. I believe this is especially true in acute sinus infection before any mucous membrane changes have taken place, but where changes in the

mucous membrane have occurred or where we are dealing with tumor formations the shadows cast are of diagnostic import.

In the 100 cases reported, the X-ray shows 28 were negative. Of these 28 cases, all but one (case No. 48) showed no clinical evidence of sinus disease. This case where the X-ray showed negative and in which a possible clinical diagnosis of sinus disease might be made was in a young man age twenty years, who one year ago complained of some stuffiness of the nose without any nasal discharge except an occasional acute rhinitis. At this time he visited a free dispensary, where the left middle turbinate was removed. Since the operation he has had an excessive amount of thick, heavy mucopurulent discharge with large crusts from the left side. At the time I examined him (one year later) I found a condition very closely resembling a chronic atrophic rhinitis on the left side. Considerable scar tissue in the region of the middle meatus was present, the nasal mucous membrane covered with a thick mucopurulent secretion with some crusts. The possibility of the purulent secretion originating from the sinuses being present, X-ray plates were taken which failed to show any sinus disease. A diagnosis of atrophic rhinitis of traumatic origin was made.

Of the 72 cases in which the X-rays revealed a cloudy sinus or sinuses, 36 were confirmed by surgical means, 21 were confirmed by clinical means other than surgery, 4 were postoperative—that is, plates taken from two weeks to six months after the sinus operation without unusual postoperative symptoms, leaving 9 cases in which the sinuses were cloudy, but which showed no clinical evidence of sinus disease. Of these nine cases the plates showed part or all of the ethmoids cloudy in four cases (Nos. 83, 84, 91 and 99). At the time of examination no evidence of ethmoid disease could be found, although all gave a history of having had former attacks of acute rhinitis with a watery or a mucopurulent discharge.

In one of the nine cases, a patient with hay fever (No. 16), the plates showed the left antrum and ethmoid cloudy. At the time of examination (July 14th) a slight congestion of the nasal mucosa with some watery secretion was observed, but no more evidence of a sinus involvement could be found. The

cloudy antrum and ethmoid could be explained through some former involvement which left a thickened mucous membrane. In another case (No. 82) the right sphenoid was cloudy with no clinical evidence of disease. The sinus was not opened and hence confirmation was not made. He had had a previous sinus involvement in which the right antrum had been opened.

Of the three remaining cases the plates revealed dark antrums. One (case No. 25) had had a cyst removed from the floor of the antrum about ten years ago. The antrum was reopened and no trouble other than a thickened mucous membrane was found. The second antral case (No. 30) had had a former antrum operation about one year ago. The plate showed a cloudy antrum, but in the absence of any clinical findings and in view of the fact of his having had a former antrum operation the antrum was not opened.

The third antral case and the last of the nine cases which were not confirmed by clinical means was case No. 8, who had had a tooth filled two years ago, since which time he has had a root abscess and later a continuous discharge from the tooth cavity. Pain, tenderness and swelling over the region of the antrum. No nasal discharge and no evidence of pus within the nose. Investigation revealed a clear antrum but a subperiosteal abscess over the region of the canine fossa, which evidently was the factor producing the cloudy appearance of the antrum.

It is interesting to note from a study of the cases (see Table 1) that where the chief symptoms were a constant nasal discharge without pain or headache, there were twenty-three cases (23 per cent); three of these ($12\frac{1}{2}$ per cent) were negative, and twenty ($87\frac{1}{2}$ per cent) showed cloudy sinuses. Of the positive cases three (cases Nos. 25, 82 and 84) were not confirmed. In those patients where the chief symptoms were a constant nasal discharge with pain or headache, there were seventeen cases (17 per cent). All of these, or 100 per cent, showed cloudy sinuses. One case (No. 19) was not confirmed.

In the group where a nasal discharge was absent, but pain or headaches present, there were thirteen cases (13 per cent). Eleven ($84\frac{2}{3}$ per cent) were negative and two ($15\frac{1}{3}$ per

cent) were positive. Neither of these positive cases (Nos. 8 and 30) was confirmed.

There were six cases (6 per cent) of intermittent nasal discharge. Four ($66\frac{2}{3}$ per cent) were negative and two ($33\frac{1}{3}$ per cent) were positive.

The chief complaint in ten cases (10 per cent) was a post-nasal discharge. Six (60 per cent) of these were negative and four (40 per cent) were positive. One of the positive cases (No. 83) was not confirmed.

There were nine cases (9 per cent) whose chief trouble was a constant or intermittent nasal hydrorrhea. Three ($33\frac{1}{3}$ per cent) of these were negative and six ($66\frac{2}{3}$ per cent) showed sinus disease. Of the six positive cases, one case (No. 99) was not confirmed. Six cases (6 per cent) suffered from asthma. One patient ($16\frac{2}{3}$ per cent) had negative sinuses, the remaining five cases ($83\frac{1}{3}$ per cent) were positive. Tumor formation other than polypi was present in seven cases (7 per cent). All (100 per cent) revealed cloudy sinuses on the affected side. There were four sarcomas, one carcinoma, one lymphoendothelioma, and one fatty cyst of the frontal sinuses and orbit. Six cases (6 per cent) had a polypoid degeneration. All (100 per cent) showed one or more sinuses cloudy. One case (1 per cent) was interesting inasmuch as the polyp which was filling the posterior portion of the inferior meatus apparently had its origin from the antrum. There were two (2 per cent) of chronic atrophic rhinitis (ozena); one case (1 per cent) of hay fever. All three cases were positive, although confirmation was not obtained in the hay fever patient (case No. 16). One case (1 per cent) was taken about six months after both sphenoids had been opened and the middle turbinates removed, incidental to an acute infection of the antrums and sphenoids. At the time the plates were taken there were no symptoms or clinical evidence of trouble. The plates showed the outlines of the sphenoids and antrums were not clear.

CONCLUSIONS.

1. The chief difficulties in deriving the full benefits of the roentgenogram properly taken and developed are (a) reading the plate—that is, determining the presence or absence of ab-

normal shadows or outlines; (b) having properly interpreted the plates, the correlation of these findings to the clinical data obtained. To do this the various modifying conditions mentioned in the first part of this paper must be considered.

2. The X-ray is a valuable supplement to clinical diagnosis, and when so combined, error in diagnosis is reduced to a minimum.

3. Valuable surgical information can be gained as to the presence or absence, size, shape, depth, etc., of the sinuses.

4. Thickenings of the mucous membrane of the sinuses, due to former operations, infections, irritations, etc., will produce a cloudy appearance or an indistinct outline of the sinus in the plate.

5. As a guide to the postoperative progress the X-ray is of little assistance in the chronically diseased sinuses.

6. The X-ray is usually essential to determine the fact that the involvement is confined to certain sinuses, sinus or part of a sinus.

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Case No.	Chief Symptoms	Duration	X-Ray Findings	Clinical Findings
1 Mrs. H.	Frequent colds; nasal discharge; complete nasal stenosis right side	Colds and discharge for years; stenosis for two months	Cloudy right antrum; outline indistinct	Fibrous polyp filling inferior meatus apparently arising from right antrum; polyp removed
2 P. W. H.	Profuse nasal discharge, worse left side. Bad odor. Began one year ago following ulcerated tooth	One year	Cloudy left frontal, ethmoid and antrum; outline indistinct	Pus emerges from middle meatus; odor; operation refused
3 Mrs. C.	Mucopurulent discharge left side; complete nasal stenosis left side	Two years; complete stenosis last two months	Cloudy left antrum	Sarcoma left antrum and nasopharynx; mucous membrane of antrum ulcerated and thickened
4 D. C. H. D.	Occasional mucopurulent discharge	Years	Negative	No evidence of sinus disease; hypertrophic posterior ends of inferior turbinates
5 D. A.	Nasal discharge and odor at times; headaches; polypi have been removed at times	Years	All sinuses cloudy; outline indistinct	Exenterated ethmoids; polypoid degeneration; Mosher operation on frontal; sphenoid opened; antrum not opened
6 E. S. C.	Nasal discharge, pain over eye and side of nose for two months	Discharge for years; pain for two months	Cloudy left antrum; outline indistinct	Operated on antrum; findings not recorded
7 H. C. B.	Postnasal discharge; frequent colds; acute rhinitis at present	Years; present rhinitis three weeks	Right ethmoid cloudy	Mucopurulent discharge from the region of both middle turbinates; slight odor; cleared up under treatment; subsequent plates clear
8 E. H. B.	Pain in right superior maxillary region since filling of tooth two years ago. Has had gumboils from tooth	Two years	Right antrum cloudy and outline indistinct; abscess at root of tooth	Antrum opened; pus found
9 U. H.	Nasal discharge left side; worse last two weeks	Years	All sinuses cloudy on left side; outline indistinct	Antrum opened left side; pus found; thickened mucous membrane
10 D. D.	Purulent discharge left side; pain and headache over left frontal. Began with nasal cold	One month	Cloudy left frontal and left anterior ethmoid	Tenderness over left frontal; pus emerging from beneath anterior portion of left middle turbinate; transillumination of antrums clear
11 Mr. D.	Complete nasal stenosis on right side; odor and discharge	Six months	Nasal cavity and right anterior ethmoids cloudy	Carcinoma of nose; operation; involvement of nasal cavity, septum and ethmoids on right side; skin around aperture of nose involved

Case No.	Chief Symptoms	Duration	X-Ray Findings	Clinical Findings
12 Mrs. H.	Asthmatic symptoms; frontal headache	Nine months	Cloudy, right ethmoids	Ethmoids exenterated on right side; hyperplastic type
13 Miss C.	Asthmatic symptoms; mucopurulent discharge alternating stenosis; has had both middle turbinates removed	Three years	Cloudy anterior ethmoids, both sides	Both groups of anterior ethmoid cells exenterated; small polypoid degeneration found on left side; right side hyperplastic
14 Mrs. B.	Nasal hydrops on left side; frequent headaches above left eye	Six months	Cloudy left bulla ethmoidalis	Bulla opened and surrounding cells curetted; mucous membrane of cells thickened
15 Miss P. J. D.	Frequent head colds and sore throat	Years	Negative; left frontal rudimentary	No evidence of sinus disease; tonsils enlarged with infected crypts
16 Miss F. D.	Sneezing and watery discharge (hay fever)	Fourth season	Left antrum and ethmoids cloudy	Findings not confirmed; no operation; pus not found; mucous and serum present in nasal cavities
17 C. M. B.	Mucopurulent discharge both sides; dull frontal headaches frequently; sneezing	Six years	Cloudy left anterior ethmoids; slight cloudiness of right anterior ethmoids	Left ant. ethmoids exenterated; mucopurulent involvement
18 P. B.	Constant head colds following partial removal of tonsils and adenoids three years ago	Three years	Left posterior ethmoids cloudy	Mucopurulent secretion found; no operation
19 D. B.	Mucous discharge and slight crusting; epipharyngeal soreness; partial nasal stenosis	Years	Negative	No evidence of sinus disease; deviated septum; some adenoid tissue present
20 Dr. S. J. B.	Headache since removal of tip of left middle turbinate	Months	Negative	No evidence of sinus disease
21 R. R. B.	Nasal discharge on right side	Months	Right ethmoid cloudy	Opened ethmoid cells right side; pus found
22 E. B.	Nasal discharge; frequent polypi; asthmatic symptoms	Four years	All sinuses cloudy and outline indistinct	Polypi present; pus in both middle meati; pus found in antrums and ethmoids; thickened mucous membrane; frontals and sphenoids not opened
23 B. L. B.	Asthmatic symptoms; partial nasal stenosis. Has had left middle turbinate removed. Has had some nasal discharge at times	Years	Negative	No evidence of sinus disease; enlarged middle turbinates and tonsils removed; asthma greatly improved

Case No.	Chief Symptoms	Duration	X-Ray Findings	Clinical Findings
24 S. A. C.	Mucopurulent nasal discharge	Months	Right antrum very cloudy and outline indistinct; left antrum slightly cloudy	Right antrum opened; pus and thickened mucous membrane
25 Mrs. D.	Nasal discharge. Had cyst of right antrum removed ten years ago	Years; worse last two months	Right antrum cloudy and outline indistinct	Right antrum opened; mucus found; membrane thickened; no pus
26 Miss P.	Postnasal discharge since removal of right middle turbinate two years ago	Two years	Negative	No pus observed; deflected septum; chronic lacunar tonsillitis
27 D. C.	Purulent discharge left side of nose; crusting in epipharynx	Years	Right anterior ethmoidals cloudy	Curetted anterior ethmoid cells and opened agar nasal cell; no record of condition of cells
28 D. D.	Frontal and occipital headache. Had sub-mucous resection four months ago which gave some relief	Years	Negative	No evidence of sinus disease; middle turbinates in firm contact with septum
29 Mrs. McE.	Frontal headaches. Occasional purulent discharge	Three years	Negative	No evidence of sinus disease; both middle turbinates in contact with septum
30 Mrs. H. D.	Dull headache, supraorbital and occipital. Has had operation on left antrum one year ago. No discharge at present	Three months	Left antrum cloudy	No evidence of pus in nose; antrum not opened
31 Miss D.C.F.	Postnasal discharge of clear mucus; frequent head colds and sore throat	Years; worse last five months	Left ethmoid and antrum slightly cloudy; outline indistinct	Mucopurulent discharge in postnasal space; hypertrophic tonsils; deviated septum
32 Miss B. G.	Excessive mucopurulent discharge; crusts, odor (ozena). Has had left antrum opened and both ethmoidals curetted	Years	Left posterior ethmoidals cloudy; left antrum is not as clear as right	Left ethmoidals curetted; mucopurulent secretion; membrane atrophic; antrum found radically opened; whitish secretion lining antrum
33 Mrs. J.A.G.	Occasional frontal headache and constant feeling of stiffness in eyeballs	Months	Negative	No evidence of sinus disease found
34 G. A. H.	Headache in right frontal and right orbital region. Purulent nasal discharge right side. Partial deafness right ear	Months	Right frontal and right ethmoid clouded and outline indistinct	Mohr operation on frontal sinus and ethmoid; pus found; cells soft and easily broken down; pus discharge profuse
35 J. H. G.	Postnasal mucous discharge; frequently yellow color; occasional occipital headaches	Years	Negative	No evidence of sinus disease

Case No.	Chief Symptoms	Duration	X-Ray Findings	Clinical Findings
36 Mrs. H.	Small amount mucopurulent secretion; occasional occipital headaches; partial nasal stenosis; frequent attacks of epipharyngitis	Years; worse lately	Right sphenoid cloudy; left uncertain	Mucopurulent discharge in posterior of nasal cavity; operation refused
37 Mr. H.	Plate taken six weeks after double Killian frontal sinus operation; slight mucous discharge; feels fine	Six weeks since operation	Both frontal sinuses cloudy and outline fairly distinct	Sinus apparently healing up nicely; discharge slight
38 Mr. L.	Yellow mucous discharge; partial nasal stenosis; symptoms of asthma; has recently had submucous resection of septum	Years	Right frontal and right anterior ethmoid clouds; outline indistinct	Mucopurulent discharge observed in middle meatus
39 Miss M.C.E.	Nasal discharge resembling continuous cold; she has had the cold; occasionally has one or two degrees of temperature	Seven months	Left frontal and left ethmoid cloudy and outline indistinct	Tenderness at inner angle of orbit; pus observed in middle meatus on both sides; vacuoles
40 M. P. L.	Intermittent stenosis on left side; occasional mucopurulent discharge; catches cold in head easily	Years	Left anterior ethmoid cloudy	Ethmoids exenterated; mucous present; mucous membrane thickened
41 F. K.	Mucopurulent postnasal discharge; frequent pains over bridge of nose	Weeks	Right antrum and left ethmoid cloudy; outline indistinct	Purulent secretion in olfactory fissure on right side; mucopus in epipharynx; transillumination reveals cloudy right antrum; antrum opened; mucopurulent secretion removed
42 Miss L. J.	Mucopurulent discharge from right nostril; has had right middle turbinate and ethmoid removed but no relief	Months	Right ethmoid cloudy	Mucopurulent secretion present in right nasal cavity
43 Miss M. L.	Postnasal drooping of mucus	Years	Negative	No evidence of sinus disease
44 F. M.	Complete nasal stenosis on left side for six weeks; nasal discharge especially from left; odor	Six months	Cloudy left frontal; ethmoid and antrum	Sarcoma removed from left nasal fossa and antrum; pus discharged from upper portion of nasal cavity
45 Miss R. S.	Postnasal discharge and frequent colds	Six years	Negative	Clear mucous discharge present in nasal fossa; vaccines given
46 Miss O.	Intermittent nasal hydrorrhea; hydrorrhea at present time for three days	Intermittent for three years	Negative	Watery discharge; no pus; mucous membrane appears normal other than congested

Case No.	Chief Symptoms	Duration	X-Ray Findings	Clinical Findings
47 Mrs. S.	Purulent discharge from right side of nose; bad odor; frontal and occipital headache; had right middle turbinate removed one year ago; no relief	Years	Cloudy, right frontal and ethmoid; outlines indistinct Negative	Killian operation on right side; sinus filled with pus; membrane ulcerated and thickened
48 H. S.	Postoperative crusting and yellow mucous discharge on left side following removal of left middle turbinate	Six months	Negative	Crust present; mucous membrane pale and atrophic; scar tissue and adhesions in region of middle turbinate
49 D. A. C.	Nasal discharge from both sides; headaches in frontal region	One year	Right ethmoid cloudy; left ethmoid slightly cloudy Negative	Right ethmoid exenterated; yellowish crust; cells contain mucopurulent secretion
50 H. P.	Severe neuralgic pain in frontal region; has had several intranasal operations without relief; has no nasal discharge	Twelve years		Clear mucous secretion in left nasal cavity
51 C. S.	Frontal headache left side; pus discharge with bad odor	One year	Left antrum cloudy	Antrum opened—pus found
52 Mrs. S.	Nasal hyrorrhea and mucous discharge; sneezing; has had polypi removal at former times	Years	Both ethmoids cloudy	Polypi removed and ethmoids exenterated; mucous membrane shows polypoid degeneration
53 R. R.	Intermittent attacks of nasal hyrorrhea	Years	Both ethmoids cloudy; right worse Negative	Mucous membrane appears thickened in region of middle turbinate; mucous present; operation in New York; no report of findings No evidence of sinus disease
54 Miss M. R.	Pain and headache in right frontal region; has had right middle turbinate removed one year ago with no relief; glasses give no relief	Two years		
55 Dr. W. R. Mc.	Partial nasal stenosis; mucous discharge; has had polypi removed one year ago	Years	Both ethmoids cloudy; left ethmoid slightly cloudy Bulla frontalis present and cloudy	Thickened mucous membrane; budding polypi; mucous discharge
56 Miss F. H. R.	Yellow pus discharge from nose, both sides; began with right frontal headache	Three months	Right frontal, left antrum and left ethmoid cloudy and outlines indistinct Negative	Pus observed in both middle meati; tenderness on pressure over right frontal and ethmoid; operation refused
57 Dr. M.	Frontal headache worse on left side; partial nasal stenosis	One year		No evidence of sinus disease

Case No.	Chief Symptoms	Duration	X-Ray Findings	Clinical Findings
58 Mrs. S.	Nasal hydnorrhea; sneezing; worse on right side	Months	Right anterior ethmoid cells cloudy	Right anterior ethmoid cells removed; membrane thickened; mucus present
59 Miss L. W.	Mucopurulent discharge; frequent acute attacks of colds and headaches	Years	Right anterior ethmoid cells cloudy	Mucopurulent discharge seen on both sides; mucous membrane congested and swollen
60 R. E. W.	Odor and nasal discharge from left side; frequent headaches	Years	Left antrum cloudy and outline indistinct	Left middle turbinate covered with a white pus discharge; pus removed from antrum
61 Mrs. E. A. S.	Frequent head colds; occasional nasal hydnorrhea	Years	Negative	No evidence of sinus disease
62 Dr. M.	Blood discharge from right nostril; swelling and induration in right supramaxillary region; has had polyp removed and antrum and ethmoids opened three months ago	Months	Right frontal, antrum and ethmoids very cloudy and outline of antrum and ethmoids lost	Sarcoma of superior maxilla with involvement of nasal cavity
63 Miss J. R. M.	Occasional pain over right eye	Nine months	Negative	No evidence of sinus disease
64 Miss T. M. (ozena)	Crusts, odor and mucopurulent discharge	Years	Left anterior ethmoids slightly cloudy	Chronic atrophic rhinitis with excessive amount of mucopurulent discharge
65 R. R.	Mucopurulent discharge from right nostril; had fibroma removed from right nostril years ago	Years	Apparently a single large ethmoid cell on right side is cloudy	A portion of the anterior ethmoid cells removed; a subsequent X-ray plate shows the absence of the involved ethmoid cell
66 Miss McG. space	Occasional dropping of mucus in postnasal space	Years	Negative	No evidence of sinus disease
67 I. R.	Nasal discharge; occasional odor; crust formation; occasional frontal headache (ozena)	Years	Left ethmoid cloudy	Mucopurulent discharge in both middle meati
68 J. W. N.	Pus discharge from left nostril; three weeks ago had polyp removed from left nasal cavity	Four years	Left antrum and ethmoid cloudy	Antrum opened; pus and polypoid degeneration of antral mucosa found
69 D. C. E. R.	Mucous discharge	Years	Both ethmoids cloudy; more marked	Mucopurulent discharge; mucous membrane in region of middle turbinate thickened
70 Mrs. H. P.	Watery discharge from nose	Six months	Negative	Both middle turbinates impacted against septum; no discharge visible

Case No.	Chief Symptoms	Duration	X-Ray Findings	Clinical Findings
71 Miss P.	Frequent head colds; mucous discharge	Years	Negative	No evidence of sinus disease
72 Miss S.	Mucopurulent nasal discharge on right side	Months	Right antrum cloudy and outline indistinct	Mucopurulent discharge in right middle meatus
73 Mrs. S.	Nasal discharge; pain over right frontal region; accidentally shot self through right temple; has had both middle turbinates removed	One year	Right sphenoid cloudy	Sphenoid opened; mucopurulent secretions found
74 Dr. S.	Frequent attacks of head colds	Years	Negative	No evidence of sinus disease
75 Dr. P.	Mucous discharge; impaired breathing	Years	Negative	No evidence of sinus disease
76 Dr. S.	Nasal discharge; tenderness over right eye	Six months	Right antrum, ethmoid and orbit cloudy	Sarcoma involving orbit, ethmoid and antrum on right side (autopsy)
77 W. S. S.	Frequent attacks nasal hydrotheca; asthmatic attacks; has had polypi and ethmoid cells removed several years ago	Years	Right ethmoids cloudy	Ethmoids curetted; complete relief
78 Miss W.	Purulent nasal discharge; frontal and occipital headaches; has had external operation on left frontal and both sphenoids opened	Two years	Left frontal, ethmoid, antrum and both sphenoids cloudy and outlines indistinct	Opened left antrum; both sphenoid and left ethmoid; mucopurulent discharge; Wassermann positive
79 W. V.	Pain and headaches in frontal region; nasal discharge; has had repeated intranasal operations without relief	Years	Left frontal and left antrum cloudy and outline indistinct	Mucopurulent discharge in left middle meatus; operation refused
80 Miss L. S.	Purulent nasal discharge	Six months	Right antrum cloudy and outline indistinct	Antrum opened and pus found
81 Miss E. W.	Purulent nasal discharge; occasional pain over right eye; had left antrum opened one year ago	Years	Left antrum, frontal and ethmoid cloudy	Antrum, frontal and ethmoid opened; pus found; mucous membrane thickened

Case No.	Chief Symptoms	Duration	X-Ray Findings	Clinical Findings
82 Mr. W. E. W.	Slight nasal discharge on right side; has had right antrum irrigated; no relief	Six months	Right sphenoid cloudy	Sphenoid not opened; diagnosis not confirmed
83 W. S. S.	Postnasal discharge of yellow mucous	Seven years	Posterior ethmoidals slightly cloudy	Not confirmed; refused operation
84 Miss E.	Mucopurulent nasal discharge; frequent head colds	Years	Right ethmoidals cloudy	Nasal cavity almost occluded by deviation of septum to right
85 Dr. C. M. M.	Has had both sphenoids opened; both middle turbinates removed incidental to an acute infection of both antrums	Six months	Sinuses clear with slight dimming of the antral and sphenoid outlines	No evidence of sinus infection
86 Mr. S.	Nasal discharge left side	Three months	Left frontal cloudy and outline indistinct	Mucopurulent discharge in region of left middle turbinate
87 Mrs. W.	Watery nasal discharge worse on right side; occasional right orbital pain	Two years	Right anterior ethmoidals and right bulla frontalis cloudy	Ethmoidals removed and bulla opened; membrane thickened
88 L. W.	Supraorbital pain and headaches	Two months	Negative	No evidence of sinus disease
89 O. B.	Postnasal discharge	Years	Negative	No evidence of sinus disease
90 Miss K.	Mucopurulent discharge from nostril; occasional pain in left orbital region	Three months	Left antrum cloudy and outline indistinct	Pus discharge from beneath anterior portion of middle turbinate; pus washed from antrum
91 H. C. K.	Nasal discharge of clear mucous; frequent attacks of acute rhinitis with attacks of frontal headaches	Years	Right ethmoidals cloudy	Operation refused; mucous discharge; membrane over middle turbinate thickened
92 C. W.	Nasal discharge left nostril; pain over left side of face	Two years	Left antrum cloudy	Mucus in antrum; membrane thickened
93 C. B.	Mucopurulent nasal discharge worse on left side	Two months	Left frontal cloudy	Pus discharge in region of left middle turbinate

Case No.	Chief Symptoms	Duration	X-Ray Findings	Clinical Findings
94 H. M.	Pus discharge and small crust formation with slight odor at times	Years	Left antrum cloudy and outline indistinct	Pus emerging from beneath both middle turbinates; small amount of mucopurulent secretion in left antrum
95 Mrs. L.	Nasal hydrops; occasional occipital headaches	Five years	Both ethmoids cloudy	Mucopurulent secretion in right superior meatus; mucous membrane of ethmoids thickened
96 Mrs. L.	Orbital pain and headaches; left antrum opened fifteen years ago	Months	Negative	No evidence of sinus disease
97 Miss B.	Frequent frontal headaches; tenderness over left frontal; dizziness on stooping	Months	Negative	No evidence of sinus disease
98 C. A.	Bulging, fluctuating swelling over region of right frontal sinus	Two months	Large triangular cloudy area involving frontal sinus and extending upwards into frontal bone	Large cyst of frontal bone filled with fatty substance
99 Mrs. L.	Repeated attacks of acute rhinitis and watery discharge	Years	Left posterior ethmoids slightly cloudy	Mucous discharge
100 Mr. F. V.	Complete nasal stenosis of left nostril; watery left eye	Two months	Dark left antrum and nasal cavity	Large round tumor mass (lymphangioendothelioma) filling left nasal fossa and left antrum; tumor removed; polypoid degeneration of antral mucosa; pus and mucous found

CHIEF SYMPTOMS.	No. of cases	X-ray neg.	Per cent	Neg. cases confirmed clinically	Sinus involvement	Per cent involved	Positive cases not confirmed	Per cent of cases not confirmed	Cases not confirmed
Constant nasal discharge without pain or headache	23	3	12½	3	20	87½	3	12½	Nos. 25, 82, 84
Constant nasal discharge with pain and headache	17	0	0	0	17	100	1	5%	No. 91
Pain or headache with no nasal discharge....	13	11	84%	11	2	15%	2	15%	Nos. 8 and 30
Intermittent nasal discharge	6	4	22%	4	2	33%	0	0	
Postnasal discharge....	10	6	60	6	4	40	1	10	No. 83
Nasal hydrops	9	3	33%	3	6	66%	1	11	No. 99
Asthma	6	1	16%	1	5	83%	0	0	
Nasal tumors	7	0	0	0	7	100	0	0	
Polypl	5	0	0	0	5	100	0	0	
Miscellaneous	4	0	0	0	4	100	1	25	No. 16
Total	100	28		28	72		9		