Dr. W. E. SAUER, St. Louis: The whole question seems to be one of susceptibility. Dunbar produced the reaction only in susceptible individuals. To say that the hay-fever patient has no pathologic nasal lesion is one thing; but to prove it is another. There are undoubtedly some pathologic lesions in the nose which are not revealed by our present methods of examination.

Dr. F. C. TODD, Minneapolis: I have no particular objection to the use of the word *neurosis*, provided it is used to mean something different from what is usually meant by it, but the fact that we do not know what this predisposing cause of hay-fever is should not permit the conclusion that it is a *neurosis*; that is simply falling back on an indefinite term. I suggested the name "*pollinosis*" (that is, I speak of the disease caused by pollen) to distinguish it from other forms with similar symptoms not due to pollen. The disease caused by pollen is the true hay-fever and not the condition occurring irrespective of that factor. It is this second kind that Dr. Ballenger cures. I am convinced that what I have taken the liberty of calling "*pollinosis*" is not dependent on any nasal malformation. That fact, it seems to me, is proved because we can, in a susceptible patient, produce the symptoms at any time of the year with the toxin, and it is not necessary to put it into the nose at all; application to the eye will produce the eye symptoms and not necessarily the nasal symptoms; likewise they can be produced by application to any mucous membrane, whether it be the mouth, nose or rectum. I should like to have the profession acknowledge that the cause is not necessarily a *neurosis* but pollen and some absolutely unknown predisposing cause. It is interesting in this connection to note that statistics show, as you all know, that asthmatic patients rarely develop tuberculosis of the lungs; likewise hay-fever patients rarely develop tuberculosis. It has also been observed that the eosinophils are increased in hay-fever and asthma and not in tuberculosis. This may have a bearing as a causative factor and it is more scientific to so consider than to satisfy ourselves with calling the disease a *neurosis*. We have the further clinical evidence that all of us for years have done multitudes of nasal operations on hay-fever patients with failure to cure. Hay-fever patients will have symptoms at any time of year if they go into a barn where there is hay. I am not prepared, however, to say that there is not a disease giving rise to similar symptoms caused by the emanations from a horse; the point I am making is that these pollen diseases are not caused by a local nasal lesion.

THE ROENTGEN RAY IN OTOLARYNGOLOGY

PRESTON M. HICKEY, M.D.
DETROIT

In introducing the subject of the value of roentgenology in otolaryngology, it is fitting to call attention to the great aid which American investigators have rendered in this field. While the painstaking work of our brethren across the water, particularly in Germany, has done much to develop the special technic necessary for the best results, I take pleasure in mentioning the work done by many American roentgenologists. Our knowledge of the anatomy and pathology of the frontal sinuses has derived much benefit from Roentgen investigation. We are able to measure accurately the exact width and extent of these bony caverns, the thickness of the anterior wall, and the distance of the anterior wall from the posterior. We can also determine the number and extent of the septa.

These anatomic facts are invaluable data in deciding many of the questions which may arise in operative cases.

The condition of the anterior wall of the sinus can be demonstrated in lateral plates as shown in three cases in which I was able to diagnose positively the presence of syphilitic necrosis of the anterior wall. The worm-

eaten erosion was absolutely pathognomonic. In one case, the sinus required to be opened in order to afford relief from the pain, but in the other two cases anti-syphilitic medication was all that was necessary to afford relief.

In the differential diagnosis of the presence or absence of secretion within the sinus, it is preferable that the examination be made with the patient in the upright position. If the sinus is only partly filled with fluid and the examination is made with the patient lying on his face, the fluid may be distributed in a thin but uniform layer and cause uncertainty in the interpretation of the plate. If, however, the patient is in the upright position, the plate will tell us if the sinus is entirely or only partially filled with secretion. In the examination of doubtful cases, the plates can be made at a time of day when from the patient's symptoms we would expect the sinus to be filled or when from the presence of the pain, we would expect that the retained secretion has not drained away.

In the last few months the intensifying screen has been used by many Roentgen operators in the investigation of the frontal sinus. While this device has the great advantage of shortening the time of exposure, converting what was formerly one of the difficult tasks of the roentgenologist into one much easier, the utmost care should be exercised in the interpretation of the plates obtained with the intensifying screen. Over-exposure and the use of a tube of too great penetration will result in obtaining plates of little contrast and in which may be easily lost the slight difference of density on which the diagnosis depends. In careful hands, however, and when experience has been the teacher, the use of the intensifying screen marks a great step for the average operator.

The stereoscopic investigation of the frontal sinus has resulted in the production of plates which are of great anatomic interest but which, aside from their demonstration of structure, have not yet proved that from the standpoint of diagnosis they possess any considerable advantage. The stereoscopic plates of the probe in the frontal sinus are usually striking and determine at once whether or not the canal has been properly catheterized.

Aside from being a corroborative aid to transillumination, the value of the Roentgen method in the study of antral diseases lies in the opportunity which it offers of differentiating between cases in which the infection has been of nasal and those in which it has been of dental origin. Carefully made films of the roots of the teeth adjacent to the infected antrum will at once tell whether the operative route should be intranasal or whether the area about the diseased root should be attacked. It certainly avails little to drain an antrum through the nose if there is a constant source of infection in a diseased root of an adjacent tooth.

The presence or absence of ethmoidal disease can often receive much aid in its diagnosis from the x-ray plate. If the pathologic condition has converted the ethmoidal cells from a pneumatic condition to one in which the air has been replaced by retained secretion or granulation tissue, the plates will afford a graphic diagnosis, particularly if the lesion is unilateral, so that the diseased side can be compared with the normal.

In the investigation of the sphenoidal sinuses, we are confronted with technical difficulties due to the fact that the shadows of the sphenoidal sinus are so superimposed on other bony parts that there results difficulty in the interpretation. The shape of the sphenoidal sinus and its depths can be shown with comparative ease. If we

wish to differentiate one sphenoidal sinus from another, we can make oblique exposures so as to avoid superimposing the shadows of the two sinuses one on the other. The differential diagnosis between a sinus which is filled with secretion and one which is not, however, still presents great difficulties.

It has been suggested that after cocaineization of the pharynx, a film as large as can be borne by the patient be placed in the mouth and the ray passed from above and behind so that the shadow of the sinuses will fall on the film. The principal ray should pass about $1\frac{1}{2}$ inches anterior to the external auditory canal and should form an angle of 10 degrees with the horizontal plane of the head.

In operating on the pituitary body by the intranasal route, it is often of considerable importance to know the distance of the anterior sphenoidal wall from a selected point on the tip of the nose and also the distance of the anterior from the posterior sphenoidal wall. I would suggest that this can be accurately measured by having the patient lie on his side, placing a lead marker, as a shot, on the tip of the nose, secured by a small piece of adhesive plaster and making a plate with the target of the x-ray tube at a known distance from the plate. The distance of the lead marker from the anterior wall of the sinus being measured and the distance of the target from the plate being known, the position and exact size of the sphenoidal boundaries can be calculated very accurately.

The number of cases of acromegaly which are now being studied makes frequent demands on the roentgenologist for the diagnosis of the condition of the sella turcica and the establishment of the integrity of the anterior and posterior clinoid processes. The increasing frequency of these cases renders an accurate study of the sphenoidal sinus of great importance in planning operative procedures.

Like the frontal sinus, the anatomy of the mastoid in the living can be studied by means of the Roentgen plate. The technic of the oblique exposure as developed by Lange gives the operating otologist a great deal of valuable information. The size and position of the lateral sinus can usually be definitely shown as well as the size and extent of the pneumatic cells.

In the diagnosis of pathologic conditions of the mastoid, the Roentgen ray offers decided aid in addition to the more classic diagnostic measures. The technic, as advanced by Lange, is of the greatest value, but often it may be found somewhat difficult to obtain plates of the two sides with the penetration necessary to make decisive comparative study.

I would suggest a technic which in my hands has been found to be quite useful. It is not advanced, however, with any idea of supplanting the technic perfected by Lange, which affords us data as to the size and shape of the normal and pathologic mastoid. My technic affords simply a comparatively easy way by which one mastoid can be compared with its fellow as to the presence of fluid or granulation tissue.

The method of examination is as follows: The patient lies on his back with the plate under the immobilized head. A very small diaphragm is centered over one mastoid with the rays passing slightly obliquely, with the direction slightly toward the occiput. An exposure is made in this position on a large plate and then the tube-holder and diaphragm are shifted till they are centered over the opposite mastoid. The two resulting exposures are made on the same plate and as the time of exposure is comparatively short, it is very easy to get

two exposures of about the same density. This shows at once whether the tip of the mastoid is filled with air or has undergone pathologic changes.

As was stated before, this technic for the investigation of the mastoid is not suggested with any idea that it will replace the lateral exposure; I feel, however, that it may be employed in suitable cases to check or corroborate the plates otherwise obtained.

Another use to which the Roentgen ray has been put in the study of otologic conditions is in determining the presence of an internal ear and auditory canal in children with congenital atresia. In a case of mine, the ear was deformed and there were no external evidences of the presence of an internal ear or bony canal. A plate made with the rays passing through the aural regions, however, so that the shadow of one side did not superimpose on the other, showed that there was a well-formed auditory canal as well as a definite internal ear. With such authoritative knowledge the question as to operation can be easily decided.

In considering the rôle of roentgenology in otolaryngology, we must remember that we are dealing with a diagnostic agent which should always be considered simply as an adjuvant and one which should not be used to the exclusion of other diagnostic measures. I consider it very wrong to hazard diagnoses simply on the plate alone. Such misuse of the Roentgen ray will serve in the long run only to cast discredit on its use.

In general, it may be stated that the basis for the interpretation of plates of the sinuses rests on the fact that the ray in passing through a bony cavity filled with air gives a contrasting outline which is sufficiently different from that obtained when the air is replaced by secretion or granulation tissue. In other words, we can tell if the pneumatic condition of the sinuses is intact. The roentgenologist should not be tempted too far beyond this basic fact in his diagnostic ardor.

Future study and collaboration between the otolaryngologist and roentgenologist will be followed by still more brilliant results. Coordinated team work will be fruitful of great good to the patient.

32 Adams Avenue, West.

ABSTRACT OF DISCUSSION

DR. SIDNEY LANGE, Cincinnati: As a roentgenologist I would not make an attempt to make a diagnosis, but simply report the findings to the otologist and let him draw the conclusions. In doing this work constantly I am impressed more and more with the accuracy of this method, and I see every day that there are a certain number of cases that cannot be accurately diagnosed or treated without the aid of an x-ray plate.

There is a type of case I often see in which there is discharge but no pain. Here the plate alone may be the deciding factor as to the origin of the discharge. In other cases there is pain about the face or head, and the diagnosis may depend entirely on the x-ray plate.

I have been especially interested in the mastoid work. I presented a paper before this Section several years ago and was then very conservative, but an experience of several years has given me much more confidence in the method. Unfortunately, it requires a large number of cases in order that the method may be accurately employed, by both the roentgenologist and the otologist. The otologist must persistently (not occasionally) use the method in order to know how to draw proper conclusions.

We are still adhering to the classification I gave to this Section several years ago in regard to mastoid disease; thus the plates may show a distinct mastoid outline, with clear crisp cell walls and clear interspaces, indicating a normal mastoid; first-degree mastoiditis as shown on the plate exhibits a haziness of the cells; the cells, instead of being air-

filled, are fluid-filled, but the cell walls are still distinct and crisp; second-degree mastoiditis shows softening of cell walls and cells filled with fluid; some of the cells may be destroyed; these cases usually require operation. Third-degree mastoiditis shows loss of structure of the mastoid. The chronic cases fall into two groups: sclerosis, which may be simple, showing nothing but solid bone, or which may be accompanied by bone defects. I have several slides showing hollowing out by cholesteatoma, only the shell of the mastoid remaining.

Dr. Hickey's original suggestion as to technic is a very valuable and helpful method, because often it is difficult to use this lateral method, especially in young children and in certain types of skulls in which the lie of the land is not favorable to getting the mastoid on the flat. His plates are, too, perhaps less difficult to interpret by one not familiar with the study of *x*-ray plates. Having the two mastoids on the same plate makes the diagnosis easier. The disadvantage is that his method shows chiefly the tip and gives no evidence of involvement of the antrum or superior part of the mastoid.

Dr. C. F. WELTY, San Francisco: The most important thing I believe (and Dr. Hickey does not lay sufficient stress on it) is the relation of the antrum of Highmore to carious teeth that may project into it. Instead of taking an *x*-ray of the antrum, take an *x*-ray of the roots of the teeth and you often get very valuable information. Trouble in the antrum can be easily demonstrated by needle puncture. The indications for operation in acute cases are so well marked that with the experienced man there is no chance of a mistake, and in a chronic case there is even less chance for making an error. It matters little whether the sinus is far forward or far back, if you have a large cell or a small one. I made a mistake in a case of furunculosis in which the mastoid was free. Possibly if I had studied the case better operation would not have been done, but this is the only condition I know of in which the *x*-ray would have been of benefit in making a diagnosis of mastoiditis.

Dr. W. W. CARTER, New York: Not very long ago I saw a patient who had ethmoiditis and involvement of the sphenoid, and there was a question of whether the antrum was serving as a reservoir for the pus. The patient objected to having the antrum explored with the needle and preferred to have an *x*-ray. He was sent to one of the most expert roentgenologists in New York, who made an excellent plate and pronounced both antra to be filled with pus. On his recommendation we submitted the patient to radical operation, opened the right antrum and found it absolutely normal; no pus whatever. The mucous membrane was not hypertrophied or thickened in any way, and when we found that condition on the right side we did not dare open the other. That was a case in which the opacity was caused by thickness of the walls of the antrum. I think the question of comparing the two sides is very important; it has been of great assistance to me.

Dr. J. E. LOGAN, Kansas City, Mo.: The Roentgen ray has proved a great adjunct to the rhinologist, and is destined to a much wider field of usefulness. In three cases of optic neuritis coming under my observation, the roentgenologist was able to demonstrate to me an excessive development of cell structure in the posterior portion of the ethmoidal body, extending above and external to the sphenoid. It is probable that in many cases of optic neuritis we shall be able to find pressure influences exerted on the trunk of the optic nerve by excessive development, together with pathologic changes in the posterior ethmoidal cells.

Dr. WENDELL PHILLIPS, New York: I have had a considerable number of *x*-ray plates made of acute and chronic mastoiditis, and have made it a routine procedure in the last two or three months in my service at the Manhattan Eye and Ear to use *x*-rays in almost every case of mastoiditis, acute and chronic, and of all ages; it has given me extreme satisfaction and is a very interesting study. I deprecate the tendency with many men to place too much reliance on the *x*-ray plate to the detriment of our clinical symptoms. I do not employ the *x*-ray as a necessity, but as a valuable adjunct.

In one *x*-ray plate in the Manhattan Eye and Ear Hospital collection the outlines and location of a large accumulation of

pus in the lateral sinus is distinctly shown, which condition was confirmed at operation. The benefit comes in outlining for the operator the existing anatomic conditions. It gives a distinct knowledge regarding location and size of the lateral sinus, and shows whether you have a pneumatic mastoid or not. A good plate, always taking both sides, is of great value.

Dr. OTTO GLOGAU, New York: I should like to mention one case, that of a young girl, suffering for years with pain in the supra-orbital region, middle turbinate hypertrophy, and slight discharge from the middle meatus of the nose. I thought it might be a hyperplastic ethmoiditis, combined with frontal sinusitis. The *x*-ray showed darkness over the frontal sinus. I did a Killian and found no sinus present. It turned out to be supra-orbital neuralgia. In another case there was marked swelling both above and below the eye in an old lady, pain in the supra-orbital region and pus below the middle turbinate. A radiograph showed darkness over the antrum and over the frontal region. I operated on the frontal sinus and there was no sinus present. The trouble was in the antrum exclusively. Thus in some cases in which the *x*-ray picture shows darkness there may be no sinus present.

Dr. MAX GOLDSTEIN, St. Louis: Negative *x*-ray findings may often be of considerable importance. As a factor in examination, negative *x*-ray findings may be as essential as negative results in the examination of tuberculous sputum. The finding of the tubercle bacillus is positive evidence of tuberculosis; the absence of the tubercle bacillus in the examined specimen of sputum, however, does not necessarily justify the conclusion that there is no tuberculosis. The same relative condition obtains as far as radiograms are concerned. If we have a definite shadow, outline or other tangible landmarks in radiography, we may infer the presence of pus or other fluid, granulations, anomalous anatomic relations, etc.; a negative *x*-ray picture in my opinion, however, does not exclude the possibility of an existing pathologic condition.

Dr. G. F. COTT, Buffalo: I had an experience lately which would demonstrate the importance of the *x*-ray. A girl, 13 years of age, had a swollen jaw. Her physician found that she was blind in one eye. I was called in, had her taken to the hospital, opened the antrum and found a quantity of pus. I intended to open the frontal sinus also, although not having an *x*-ray picture at the time. I worked away until I felt that I was near the danger point and stopped. The child recovered in a few weeks, and we then had an *x*-ray picture made. We found that she had no frontal sinuses. In that case it would have been very valuable to have had an *x*-ray picture taken before the operation, but it was very necessary to act quickly.

Dr. B. R. SHURLY, Detroit: I have a case in mind which showed that this modern method offered us something that was absolutely unknown heretofore, as a method of differentiation in some of our more difficult cases of frontal sinus disease. This patient was suffering from necrosis of the anterior wall of the frontal sinus, which gave, by ordinary methods of diagnosis, absolutely no indication whatever of the trouble. On examination with the *x*-ray we were able to make a diagnosis of necrosis of the wall, although the history was absolutely negative. A radical operation gave immediate relief. The mapping out of the frontal sinus before operation is an exceedingly valuable aid, and this applies, of course, to the sinus in the mastoid, outlines which we can so readily obtain by this *x*-ray method.

Dr. P. M. HICKEY, Detroit: We are dealing with one of the newer aids to diagnosis. Not everything is yet known about it, and undoubtedly many wrong interpretations have been made and will continue to be made, though we hope they will become fewer and fewer. It seems to me that the field under discussion is one which can extend over into the border of otolaryngology for the benefit of the patient and that the accuracy of this method lies in the correct interpretation of the plates. We are perhaps too apt to think that when the plates have been taken there is the end to the work. I think that the whole field of work is in the interpretation of the plates. One can train one's office girl to make the plates; that is a simple matter of technic, but the deduction of proper conclusions from them is the great field of study.