

USE OF IODIZED OIL IN THE TREATMENT OF
INFECTIONS OF THE NASAL ANTRUM

HENRY M. GOODYEAR, M.D.

CINCINNATI

My first experience in the use of iodized oil was in 1925, when I used this material as an opaque contrast medium in the making of roentgenograms of the maxillary and sphenoid sinuses. At that time patients occasionally volunteered that their condition was much improved after roentgenograms were made. I suspected that it was the oil which had helped them and ventured the assertion that iodized oil was of some medicinal value in the treatment of infections of the nasal sinuses.¹

I later observed that I was getting better results when oil was used in the sinuses than I had obtained by irrigation or by the use of alcohol or many of the antiseptic solutions which I had tried in the treatment of acute and subacute infections of the antrum. I soon learned that the injection of 2 cc. of iodized oil into the antrum at intervals of a week or ten days accomplished much more than frequent irrigation.

Every infection of the antrum is accompanied by some infection of the ethmoid cells, and it was soon noted that treatment of the antrums with iodized oil was of the greatest aid in clearing the accompanying infection of the ethmoid cells. Experimentally, it was evident that oil placed in the antrums would be found in the frontal sinuses and the ethmoid area shortly after injection, depending on the position of the head. In June 1930 I presented before this society pictures showing the results of these experiments.²

I have tried a number of dilutions with various oil mediums and have come to regard 27 per cent iodized and 7.5 per cent chlorinated peanut oil as the most satisfactory in my hands, 2 cc. being the average amount used in each antrum.

In most of my cases the oil is injected by means of a double curved cannula, through the normal ostium. If this cannot be accomplished, a straight needle is used under the inferior turbinate (fig. 1).

Read before the Section on Laryngology, Otology and Rhinology at the Ninety-Second Annual Session of the American Medical Association, Cleveland, June 4, 1941.

1. Goodyear, H. M.: Iodized Oil in the Diagnosis of Nasal Sinus Conditions, *Arch. Otolaryng.* **4**:223-227 (Sept.) 1926.

2. Goodyear, H. M.: Use of Iodized Oil in Diagnosis of Nasal Sinus Conditions: Further Observations, *J. A. M. A.* **95**:1002-1006 (Oct. 4) 1930.

Here I wish to emphasize the care which must be used in selecting a double curved cannula if one is to be successful in using the normal ostium for the injection of oil. If the cannula is even 1 mm. greater in diameter than the one pictured here (fig. 1), the number of successful entries into a normal ostium will be reduced to a surprising degree.

IRRIGATION OF THE ANTRUM

I have no quarrel with the occasional irrigation of an antrum in which there is an acute infection and in which the pus is heavy and difficult to remove, but after every irrigation some water remains in the antrum and, mixed with some pus and infective material and incubated at body temperature, serves as an excellent medium for the growth of any organisms which are present. It is only rarely that I feel that an irrigation is necessary.

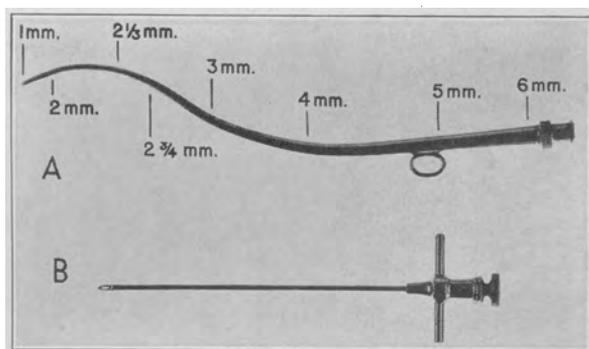


Fig. 1.—Instruments used, with Luer fittings: (A) double curved cannula for filling the antrum through the middle meatus, which may be bent to a more acute curve if desired; (B) straight 17 gage needle for use in the inferior meatus.

Injection of Oil After Irrigation.—If an irrigation is performed, I inject the iodized oil immediately, before the cannula is removed. One may argue that the oil will float on top of the water which remains in the antrum and thus be ineffective. This is not the case, however, as iodized oil is heavier than water and sinks to the bottom, helping to displace the water, as can be demonstrated easily in vitro or by roentgenograms made after irrigation and the injection of oil (fig. 2).

ACUTE INFECTION

It has been my plan not to irrigate or make injections into antrums with acute infection until four or five days after the onset of the infection unless the pain over the antrum is unduly severe. I believe that this severe pain is frequently due to a closing of the normal ostium, and not infrequently one feels or hears the influx of air as the opening is entered,

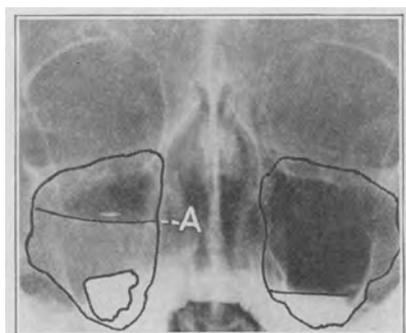


Fig. 2.—A woman aged 36, with pain over the right temple and the right side of the face and with a discharge of pus from the right naris, had a history of cold of twelve days' duration. On irrigation, thick pus with considerable foul odor was returned. Iodized oil was injected before the cannula was removed, and a roentgenogram showed that the oil gravitated immediately to the bottom of the sinus. Note the oil lying on the thickened membrane, and the water level (*A*) in the right antrum. The left antrum shows normal filling and no infection. The second injection of oil was made four days later, and one week later the antrum was free from pus.

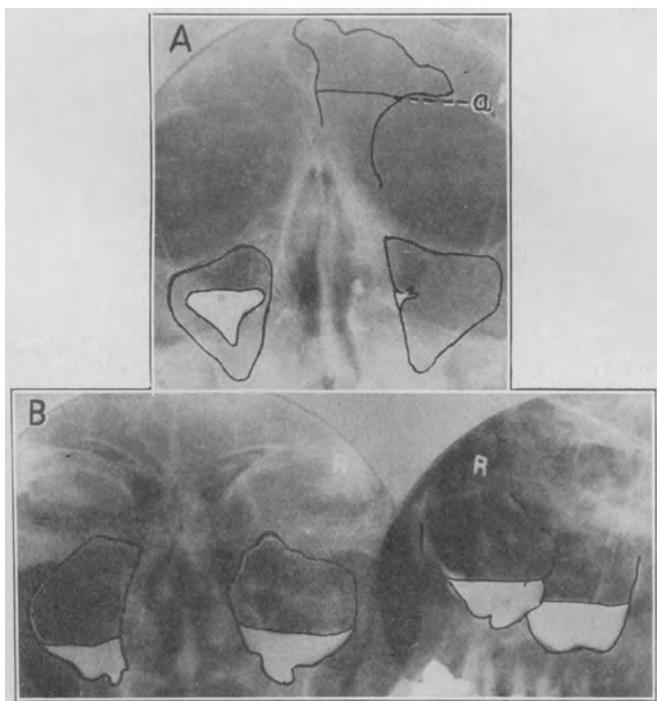


Fig. 3.—A man aged 74 had a history of an acute cold and bronchial cough of two weeks' duration. Very little oil was retained, as evidenced by roentgenogram *A*. Note the fluid level (*a*) in the right frontal sinus. Oil was injected again on the third, the sixth and the thirteenth day after the first injection. A check with oil and roentgenograms ten days later showed the sinuses to be clear and the filling of the antrum normal after four injections of iodized oil (*B*).

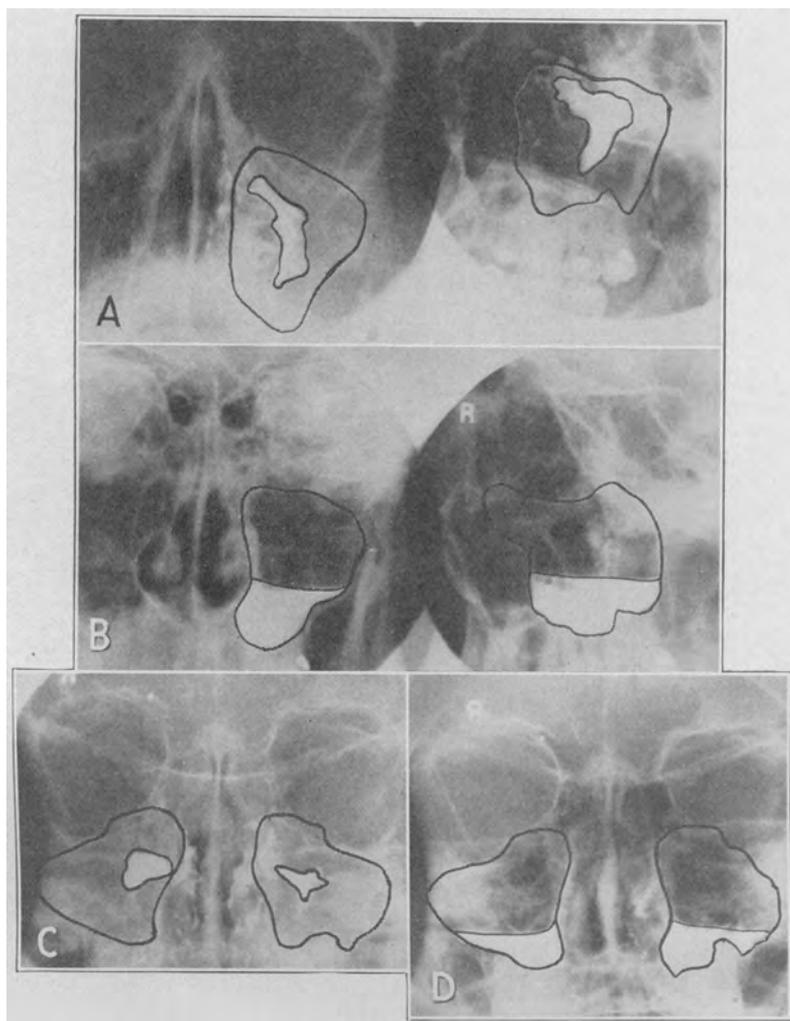


Fig. 4.—A man aged 28 had a cold for ten days and discomfort over the right antrum for six days. Note the marked filling defect in the right antrum (*A*). There was immediate improvement, and no further treatment was given for nine days, when a second injection and roentgenogram were made (*B*), showing that one injection of oil was sufficient to clear the sinus.

A boy aged 12 had a cold for three weeks and frontal headache on the left side for four days. A roentgenogram made after an injection of oil showed a marked filling defect in each antrum (*C*). There was immediate improvement. A second injection of oil was made seven days later. The sinuses were checked eleven days after the second injection (*D*), showing that two injections of oil were sufficient to clear the antra, with relief of all symptoms. The infection in this case was severe. Recovery after two injections of oil was excellent.

usually with relief of pain. At the first injection only a few drops of oil may be retained (fig. 3), or there may be a return of free pus, in which case irrigation may be done if desired and oil inserted at the end of the irrigation (fig. 2). However, many patients even with a discharge of free pus do well without irrigation.

Frequency of Injections.—If very little oil is retained or if there is a return of pus, I usually inject oil again on the third or fourth day and then wait five to seven days before making the next injection. Ten days later it is well to inject oil and make a second roentgenogram, to check the progress, unless free pus is returned after the injection. One to three injections are all that may be required for many acute infections or subacute infections in an early stage (fig. 4).

It has been my experience that an acutely infected antrum will empty more rapidly than a normal antrum on the opposite side if oil has been

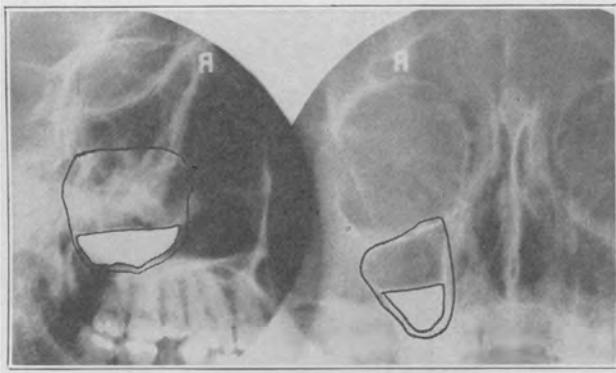


Fig. 5.—A woman aged 46 had a history of a severe cold three weeks before examination, with slight tenderness over the right antrum, followed by severe bronchial cough. An intranasal entrance into the antrum on the left side had been made after a dental infection four years before, and this sinus was clear, with a good opening. Oil was injected into the right antrum, and the patient stated that the cough was practically relieved within thirty-six hours. Frequently in cases of this kind there is no more than a 2 mm. thickening of the antral membrane. No further treatment was required in this case.

injected into the two cavities at the same time. This observation coincides with that of Bowen-Davies.³

SUBACUTE INFECTIONS

Subacute infections probably give the most spectacular response to injections of oil. Not infrequently patients with infection of this kind come for examination complaining of a cold which has persisted for two

3. Bowen-Davies, A.: The Paranasal Sinuses in Children, Proc. Roy. Soc. Med. **31**:1411-1415 (Oct.) 1938.

or three weeks or a severe bronchial cough which has not been relieved by cough remedies and codeine. Often the cough is relieved within forty-eight hours after the injection of oil (fig. 5). A roentgenogram is made at this time, and usually I do not make a second injection for ten days or two weeks, at which time oil is again injected and a roentgenogram made, to note the progress. If there is still cough or symptoms of remaining infection, the making of this second roentgenogram, front and side view on one film, is delayed for another ten days or more. Often a single injection gives relief to a patient with infection of this kind, and at the second injection the antrum may show perfect filling.

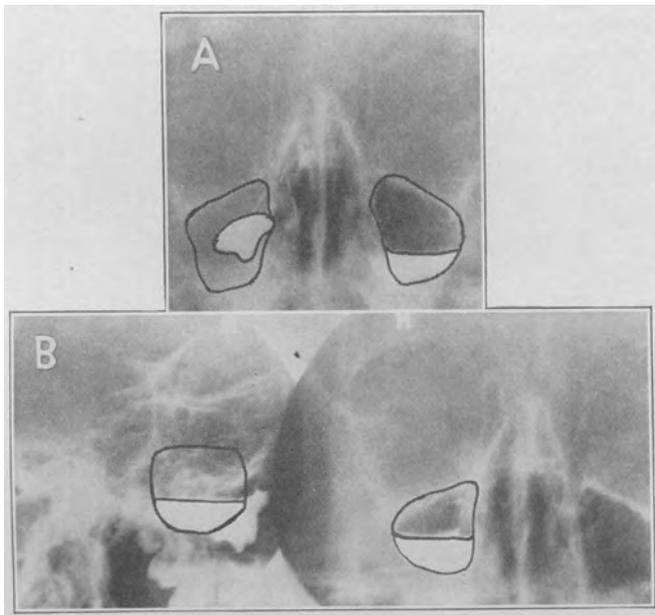


Fig. 6.—A boy aged 12 was seen by me in September. He had a history of pus discharge from the right side of the nose and cough following a cold in April (seven months previously). He had had nasal treatments and spent some weeks in Florida, hoping to be relieved. There was mucopus in the ethmoid region, and a roentgenogram revealed a marked defect in the filling of the right antrum (A), with clouding of the right ethmoid cells. Oil was again injected five, thirteen, nineteen, twenty-six and thirty-three days after the first injection—a total of six injections of oil. These were followed by a final injection of oil and the making of a roentgenogram three weeks later (B), which showed that recovery was complete.

CHRONIC INFECTIONS

The recuperating power of the antral membrane is often surprising (fig. 6). It has been my plan in cases of chronic infection to advise

surgical drainage, but if surgical intervention is contraindicated or operative treatment refused, I find that the injection of oil at intervals of ten days or three weeks will give the patient a great deal of relief. Even patients with atrophic rhinitis experience considerable comfort from the injection of iodized oil into the antrums, and if they have large normal ostiums, the treatment is simple. Some oil will remain in a sinus which is the site of chronic infection for an average of from seven to fourteen days.

SUMMARY

The use of iodized oil has greatly reduced the number of treatments necessary in cases in which irrigation was formerly used for the treatment of infection of the antrum.

When irrigation is used, iodized oil is injected before the cannula is removed. The oil will prevent water from standing on the floor of the antrum and has a favorable effect on the infected membrane.

Infection of the ethmoid sinuses and bronchial cough accompanying infection of the antrum are favorably influenced by the injection of iodized oil into the antrums.

Iodized oil is effective in the treatment of chronic infection which is in an early stage and helpful in the treatment of old chronic infection for which surgical treatment is refused or contraindicated.

556 Doctors' Building, Cincinnati.

ABSTRACT OF DISCUSSION

DR. ARTHUR W. PROETZ, St. Louis: I have followed Dr. Goodyear's work for the last ten years and in that time have had considerable experience with iodized oils myself, but I have never been able to convince myself that I could do anything with them which I couldn't do better in some other way. I don't quite know how to reconcile Dr. Goodyear's experience with my own. I have tried to analyze the situation and to see what occurs when this type of oil is put in the sinuses. Iodized-chlorinized oils are chemically inert; the oil, iodine and chlorine are in chemical combination. They are not simply solutions. The oil is heavy; it has a high specific gravity and therefore sinks to the bottom, as Dr. Goodyear says. It is an oily principle. What is accomplished when a medium such as this is used?

(Dr. Proetz then showed two slides.)

Here in a test tube is 2 cc. of an oil such as that Dr. Goodyear describes, in 15 cc. of a watery solution (which is the average content of the antrum). The oil lies at the bottom of the fluid; very little floats on top. The interesting thing is that the solution in which this rests is 1 per cent silver nitrate.

Here it is again, after two hours at body temperature, and the solution is still quite clear. In other words, the iodine and the chlorine in the oil are not given off at all, are thoroughly well fixed and produce no precipitate.

There is 2 cc. of oil in a 15 cc. antrum. Since the oil goes to the bottom of a sinus, it is conceivable, of course, that it displaces the secretions lying there

and for the time being protects the membrane from the action of these secretions; but the best it can do is to push the secretions up perhaps 1 or 2 cc., and what then prevents these from similarly affecting the membrane a centimeter higher up?

It is difficult for me to see how a few applications of oil or any other solution can so affect what I understand to be the process of subacute, or chronic, sinusitis as to make so much difference. My experiences have not been those of Dr. Goodyear.

DR. O. E. VAN ALYEA, Chicago: Iodized oil has been widely used in rhinologic practice for a number of years. Because of its radiopaque quality, it serves as an important diagnostic aid in cases of sinus disease. Dr. Goodyear, while using the oil as a contrast medium in the sinuses, inadvertently noticed another quality, its value as a therapeutic agent. This quality has been noted by others at various times. A few articles in the recent literature, both in this country and abroad, direct attention to the beneficial effects of the oil incidental to its use in contrast studies.

Dr. Goodyear advocates the use of iodized oil in the treatment of maxillary sinusitis in the various stages. In an ordinary case of acute sinusitis, at least in the early stages, little local treatment is indicated. It has long been generally conceded that there is a marked disposition on the part of an acute infection to heal spontaneously and that those infections which persist do so because of impairment of drainage. The same impairment which interferes with early healing may cause the condition to become chronic. Improvement at the proper time in the facilities for drainage may aid in the cure of a subacute infection and prevent the development of a chronic condition. The rhinologist has at his disposal certain local measures which are helpful in promoting drainage. He may apply decongestants to the mucosa of the middle meatus, and, if necessary, he may unblock the meatus by pushing aside an obstructing middle turbinate. He may also irrigate the sinus, and this in itself is one of the most useful measures available for the restoration of sinal drainage.

Irrigation may be carried out with comparative safety and very effectively, as Dr. Goodyear has stated, after the stage of acute engorgement has passed. The removal of a collection of pus or mucopus through a patent ostium by means of lavage with a saline solution aids materially in the reestablishment of ciliary action, which is so important to the health of the sinus.

All rhinologists have noted the remarkable improvement which often follows a treatment of this type. In many instances, no further therapy is needed. I wonder if the instillation of a heavy oil at this time is the best thing for the already overworked cilia. I should like to ask Dr. Goodyear if he hasn't found many infections of the subacute or early chronic type which responded to irrigation alone without the need of an antiseptic.

In a chronic condition, after changes in the tissues have taken place, the futility of irrigation therapy is well known. Overirrigation in any stage is harmful and may prolong the infection. Most observers think this result is due to the further trauma added to the disease of the mucosa rather than to the residue of the irrigating solution. Rhinologists are ever on the alert for some means short of surgical intervention which will aid in the relief of this condition. A search is being made for a solution which is not harmful to the mucosa yet is effective against the invading organisms. Perhaps Dr. Goodyear has found such an agent in the iodized oil. The solution described, aside from its effect on the cilia, should be harmless, being a weak solution of iodine in vegetable oil, and Dr. Good-

year vouches for its effectiveness. If he is able with his treatment to hasten recovery and to eliminate the need for surgical intervention in only a small percentage of cases, he has made a contribution which will be a welcome addition to the all too meager list of effective therapeutic measures.

DR. PAUL M. MOORE JR., Cleveland: For years all rhinologists have felt the need for some medicament which can be put into an infected sinus to hasten recovery. The ordinary antiseptics are eliminated, because if they are strong enough to affect the bacteria, they are too strong for the nasal and sinus mucosa and immediately disable an already crippled ciliary mechanism. The use of preparations such as these would result in further interference with the drainage from the sinus and in further stagnation of the pus.

The ideal preparation would have no detrimental effect on the ciliary mechanism; it would tend to shrink the swollen tissues and allay the inflammation, so that better drainage would be obtained, and it would inhibit the growth of the invading bacteria or affect them in such a way that the defense forces of the body could dispose of them more readily.

The iodized oil suggested by Dr. Goodyear may fulfil at least some of these requirements. It has been used for many years in mapping sinuses and lungs and has not seemed to cause any detrimental effects. I am inclined to think that the good results reported by Dr. Goodyear are due to the mechanical displacement of the pus and not to any bactericidal effect of the iodized oil.

One point which Dr. Goodyear mentioned in his paper and which has been commented on by Dr. Van Alyea can well be emphasized even further. This is the danger involved in too frequent irrigation of an infected sinus. While cleanliness of any infected tissue is the most important factor in treatment, avoidance of trauma is a close second. All rhinologists have seen too many infections in sinuses, mastoidectomy wounds and elsewhere perpetuated by overtreatment. An infected sinus should not be irrigated more often than every three or four days, and many do better when treated at even longer intervals. Each case should be judged on its own merits and the optimum interval determined.

No matter how expert one may be, a certain amount of trauma occurs every time a sinus is washed. Even though the trauma be ever so slight, if it is repeated often enough, it will result in further swelling of the tissues and interference with the drainage from the sinus. For this reason I am opposed to the daily irrigation of sinuses.

Also, it is sometimes wiser to puncture and wash through the inferior meatus than to wash through the natural ostium. While I use the natural ostium in the great majority of cases, I find that in some the ostium is so difficult to open that I cannot help traumatizing the tissues too much in the insertion of the cannula. This results in further swelling of the tissues in the middle meatus, which in turn interferes further with the drainage of the sinus and defeats the purpose of the treatment. If one must produce much trauma in order to wash a sinus, one should make sure that this takes place in the inferior meatus, where no harm will result.

DR. THEODORE E. WALSH, St. Louis: I was much interested in Dr. Goodyear's paper, but I feel, as Dr. Proetz does, that I can't quite understand how the treatment works. It just doesn't make sense to me that it should come out so well. Is this because the oil is an antiseptic? One can hardly believe so. Is it because of the displacement of secretions? Again, one can hardly believe so, because if that were true, then washing alone would be efficient. Why is it,

then, that Dr. Goodyear gets such good results all the time? It is possible that it is because of the shrinking of the tissues in the middle meatus when he puts in the oil. I think all rhinologists have obtained comparable results in many cases simply by shrinking the nasal mucosa, allowing some ciliary drainage from the sinuses.

I have seen roentgenograms similar to Dr. Goodyear's, in which the blown-up membranes characteristic of an acute infection were seen to have resolved completely with no treatment at all in a week or two, and I cannot see how the oil could have anything to do with that resolution. Neither can I understand how oil alone can make a chronically infected membrane a normal membrane in time. If one examines sections of the infected tissues, there is evident so much fibrosis and so much change that I don't see how anything can make the membranes resolve.

DR. FRANK R. SPENCER, Boulder, Colo.: I have used iodized oil in the maxillary sinus particularly a number of times for diagnosis, only occasionally for therapy.

I should like to ask Dr. Goodyear if he has had any difficulty with iodized oil going down through the larynx and trachea into the lungs. There is quite a little in the literature now about the danger of lipoid pneumonia. I am sure that any one as careful as he is can probably avoid that complication. We in the out-patient clinic at the University of Colorado use iodized oil routinely for displacement of the contents of the sinuses and for treatment. It is a valuable method of treatment. We also on occasion use weak solutions of ephedrine in saline solution. We use other remedies, too, of course, but the use of iodized oil is a valuable contribution to the treatment of diseases not only of the maxillary sinus but of all the sinuses.

I am in favor of irrigating an acutely infected maxillary sinus after the first few days. I do not restrict the route of irrigation to the middle meatus or to the inferior meatus alone; I like to irrigate through either the inferior or the middle meatus, depending on which seems best for the particular patient. Sometimes, if one tries one method and it doesn't work, one must try the other. I like to do for each patient what seems best.

DR. HENRY M. GOODYEAR, Cincinnati: I want to thank all those who have participated in the discussion for their kindness and important contributions to my subject.

I shall answer first Dr. Proetz and Dr. Walsh, who feel that this treatment is difficult to explain on a chemical basis. I agree that from a chemical standpoint it has not been explained satisfactorily, yet empirically it works.

The preparation may have had something to do with the results I have shown here. The oil I have been using has two halogens, iodine and chlorine, uniting on adjacent carbon atoms of the unsaturated fatty acid esters of the peanut oil. In general, compounds having both iodine and chlorine attached to adjacent carbon atoms possess greater stability than those having two iodine atoms in similar positions.

Having a specific gravity of 1.23 at 25 C., the oil is sufficiently heavy to displace mucopurulent secretions present in infected cavities by gravitating to the bottom of these spaces and displacing the materials contained therein. Thus, even the mechanical action has a beneficial influence as a therapeutic agent. I have not been able to demonstrate bactericidal action in a test tube. Yet iodism will occur quickly after injection of the antrum in people sensitive to iodine.

I hope that what I have given here this morning may help to stimulate further investigation. Dr. Proetz has done excellent work in research, and I hope he will do something in determining just how iodine acts chemically in the antrums.

Dr. Van Alyea asked if I did not get as good results with irrigation. No. In fact, I have done fewer irrigations each year for the past five or six years, until now I rarely irrigate an antrum but depend on the iodine-chlorine oil for treatment and for roentgen diagnosis.

Dr. Moore has suggested that perhaps the result is due to mechanical displacement. No doubt this feature is of importance.

Dr. Spencer asked if this oil migrates to the lungs. I do not know if it does. It is a vegetable oil. I have had no unfavorable results from its use.