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dl 1/28/2020USE OF IODIZED OIL IN DIAGNOSIS
AND TREATMENT OF BRONCHIAL
AFFECTIONS

STUART PRITCHARD, M.D.

BRUCE WHYTE, M.D.

AND

J. K. M. GORDON, M.D.

BATTLE CREEK, MICH.

Iodized oil is used as an opaque medium in the roentgenographic study of body cavities. It was first employed by Sicard and Forestier in 1921 as an aid in locating and demonstrating obstructions of the spinal canal, and later was used successfully by the originators in exploring dilatations, fistulous tracts and cavities of the bronchial tree and the pulmonary tissues.

Since October, 1924, we have employed iodized oil in the form of bronchial injections as a diagnostic and therapeutic agent. This article is based on the results of this study and also the writings of Sicard and Forestier, Sargent and Cottenot, Nigoul-Foussal, Ballon, Archibald and others.

The iodized oil we have employed is the chemical compound of 40 per cent metallic iodine with oil of poppy seeds described and used by Forestier. The oil and iodine are so closely combined that the ordinary starch test fails to reveal free iodine.

Iodized oil is of clear amber color, is neutral in reaction, has a specific gravity of 1.350, and is insoluble in water or alcohol. The iodine may be liberated by the alkaline carbonates of the saliva and intestinal secretions, but is not affected by the gastric acidity. It becomes brown when exposed to the action of light, air, humidity and high temperature, because of the liberation of iodine. The high iodine content of the compound renders it opaque to the roentgen rays. The value of the oil as a diagnostic agent is due to its resistance to the roentgen ray and to its tolerance by the bronchial mucous membrane. The therapeutic advantages are due to the slow rate of absorption of the contained iodine without harmful effect on the patient. Iodism does not occur unless the oil is swallowed and subjected to the action of the intestinal secretions. The slow liberation of iodine prevents the danger of pulmonary congestion, which sometimes follows the use of iodides. It must not be used, however, when brown, on account of the caustic effect of free iodine.

There are four methods of introducing iodized oil into the bronchial tree: namely, the supraglottic, the transglottic, the subglottic and the bronchoscopic. In the first and second procedures, a curved cannula is used. In the subglottic method, a hollow curved needle.

is passed through the cricothyroid membrane into the trachea, while in the fourth the oil is introduced through the bronchoscope.

The following general principles should be observed in all methods:

1. The use of discolored oil should be avoided.
2. Warm oil should be used, as it flows more freely and lessens the tendency toward cough.
3. Solutions for anesthesia should be warmed.
4. Roentgenographic exposures should be made as soon after injection as possible, and cough should be prevented by any unnecessary movements of the patient.

METHODS OF INTRODUCTION

Supraglottic.—In some patients the injection can be made without local anesthesia, but a better procedure is to swab the pharynx, soft palate (velum) and the base of the tongue with a 10 per cent cocaine solution. After an interval of three minutes, 1 cc. of warmed 1 per cent cocaine solution should be dropped into the glottis with the aid of a laryngeal mirror, syringe and curved cannula. Five minutes later the injection can be made. The patient sits facing the operator and slightly inclined toward the side to be injected, and is instructed to pull the tongue forward and breathe normally throughout this stage of the operation. A 20 cc. syringe filled with warmed iodized oil is firmly attached to a 6 inch cannula having its distal end curved to a right angle or less. With the aid of a laryngeal mirror, the tip of the cannula is introduced behind the base of the tongue held over the glottis, and the oil is slowly expelled from the syringe into the larynx. We have found that it is best to give no instructions to the patient regarding the manner of breathing, except in case of threatened cough, when a deep inspiration is advised.

Transglottic.—This method of injection is made with the tip of the cannula passed through the glottis into the trachea. The pharynx, velum and base of the tongue are anesthetized as in the supraglottic method, but for the larynx and trachea the quantity of 1 per cent cocaine is increased to 1 to 3 cc., on account of the deeper degree of anesthesia required.

Subglottic.—In this method, devised by Rosenthal, any difficulty in passing the larynx is avoided, and the oil is injected directly into the trachea. After anesthesia of the skin and subjacent tissue, a hollow curved needle attached to a metal guard is pushed through the cricothyroid membrane and into the lumen of the trachea. The position of the needle should be verified by attaching a syringe and aspirating, the withdrawal of air or mucus showing the needle to be in the trachea. From 1 to 2 cc. of warmed 1 per cent cocaine solution is then slowly injected through the needle, in order to anesthetize the mucosa of the trachea and bronchi of the desired area. The patient may cough for a short time. After from three to five minutes the iodized oil should be injected by means of a metal syringe firmly connected with the needle by a piece of strong rubber tubing. The tubing allows a certain motility of the syringe and must be strong to withstand the pressure necessary to force the oil through the needle.

POSITION OF PATIENT

The patient's position during injection is important as the distribution of the oil is determined by gravitation and the aspirating power of the lung. If one observes the progress of the oil on a fluoroscopic screen during

injection, the greater portion may be seen to follow the most dependent bronchial trunks. For this reason the inferior lobes are most easily injected with the patient sitting. The oil is directed to the right or left bronchus by inclining the patient slightly in a corresponding direction during the injection. The middle and upper lobes can be injected only when the patient is lying, and with this position the supraglottic method is still effective, but the transglottic, the subglottic and the bronchoscopic may be used. To fill the apical bronchi, the patient should be placed on a tilting table with the desired side downward. A few seconds after the injection, the head of the table is lowered for a minute to permit the oil to flow into the upper lobe.

A useful exploration requires from 10 to 20 cc. of oil, and in the presence of large bronchial dilatations the lung will accept 40 cc. without evidence of distress. When injecting more than 20 cc. of oil, the transglottic, subglottic or bronchoscopic method is preferable.

COMMENT ON METHODS

In the application of any method, the patient should be told what is being attempted, and assurance given. In this way cooperation is obtained, time is saved, less anesthesia is used, and better results are accomplished.

The supraglottic method without anesthesia will seldom be successful with patients who are apprehensive or in whom the larynx and trachea are irritable from previous cough of long standing. Even with anesthesia, it is rejected by Forestier¹ as being rarely satisfactory. On the other hand, it is upheld by Claisse and Causade.² In our experience, the supraglottic method with local anesthesia has been successful in the great majority of cases, and in the absence of unusual laryngeal irritability it is always tried first. The method, however, is more satisfactory in the injection of areas lying at or below the level of the lung roots, as the oil follows the path of least resistance.

Prior to the bronchial injection, the patient should have a physical examination of the chest and a roentgenologic study. When the examination is repeated after the injection, considerable information may be obtained regarding bronchial irregularities, the size, shape and position of the trachea, and a detailed knowledge of the contents of the lung root zone not otherwise revealed by any other diagnostic procedure. The roentgen-ray study should include oblique stereo-roentgenograms in addition to the ordinary postero-anterior exposures. The trachea and its bifurcation are thereby clearly outlined, and images which otherwise would remain obscured by the cardiac and diaphragmatic densities are definitely exposed.

It is necessary to make the postoperative roentgen-ray study immediately following the injection, with as little disturbance of the patient as possible, for the reason that with the return of the cough reflex the larger bronchi may become partially emptied and valuable information be lost. Hence, in a patient showing unusual irritability of the trachea, it may be necessary to abandon the technic and make both the injection and the exposures on the roentgen-ray table.

The practitioner intending to use iodized oil in the diagnosis of pathologic conditions of the lungs should first practice injections in normal subjects, and so learn to recognize the shadows characteristic of all parts of the uninjured bronchial tree.

1. Forestier, Jacques: Iodized Oil in Radiologic Practice, Paris méd. 1: 377 (April 26), 1924.
2. Claisse, P., and Serrand, J.: Bull. et mém. Soc. méd. d. hôp. de Paris 46: 579 (April 7) 1922.

In the normal (fig. 1), the trachea and the large bronchi are shown in outline by the oil, which clings to their walls, but the smaller bronchi appear as continuous solid lines, which diminish in width as they approach the thoracic wall. Surrounding the bronchi, the filled alveoli are represented by a coarse stippling. After the patient has coughed, the hitherto unbroken line of the bronchial shadow becomes interrupted, but the alveolar shadows remain. This broken bronchial line can also be caused by the use of an insufficient quantity of oil. The alveolar shadows remain unchanged for about twenty-four hours and then gradually disappear during the ensuing ten days. Forestier³ says that the urinary elimination of iodine passes its maximum after the third day but persists to the amount of several milligrams daily, as long as there are pulmonary shadows.

grapes (fig. 2), drops of tar or even the fingers of a glove, as described by Sergent and Cottenot.⁴ These abnormal shadows stand out in excellent contrast with the regular and more delicate outlines of the surrounding normal area.

The presence of fragmented bronchial lines in films made before the patient begins to cough may be consid-

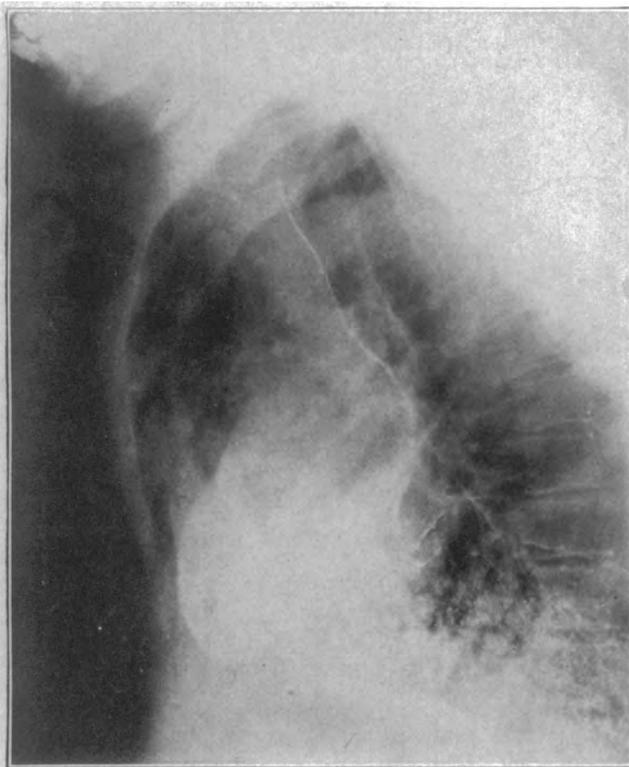


Fig. 1.—Outline of the trachea and its relationship to the arch of the aorta.

PATHOLOGIC PICTURE

The sharply defined outline of the trachea and its bifurcating branches enables one easily to recognize the exact site of conditions such as deviation or compression. It is unwise to dismiss the possibility of an anteroposterior compression of the trachea without the study of films taken in the oblique or lateral position (fig. 1).

Iodized oil, however, finds its greatest usefulness in the visualizing of bronchial dilatations and particularly in those earlier cases wherein cough is the chief or only symptom, and both physical examination and the roentgen ray fail to locate the focus. After injection, these early dilatations are shown as small, pouch-like shadows. Those of longer standing (more advanced) may be cylindrical or may resemble a hanging bunch of

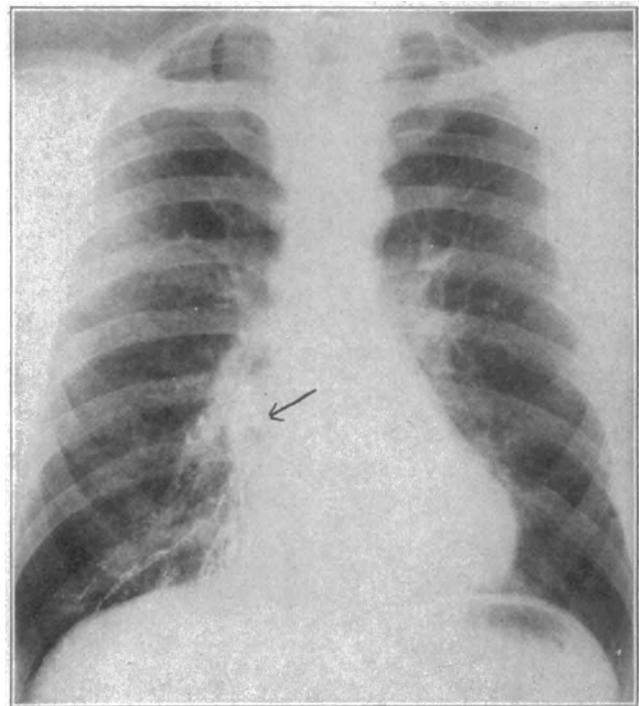


Fig. 2.—“Bunch of grapes” bronchiectatic area, revealed by the injection of iodized oil.

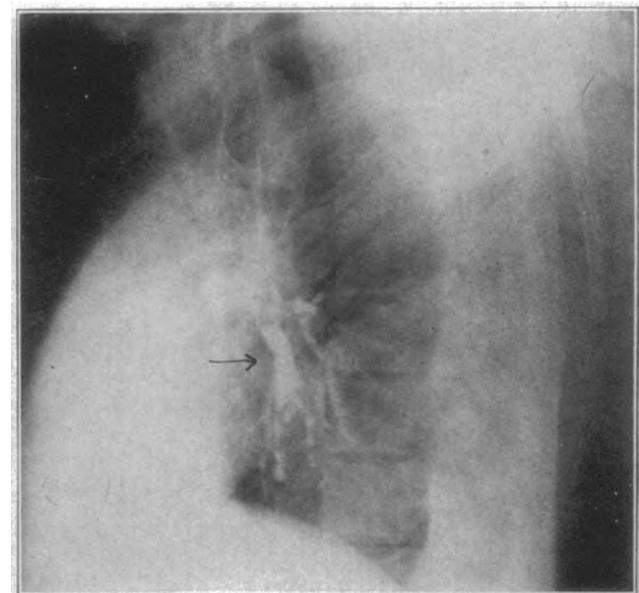


Fig. 3.—A well visualized lung abscess in the left thorax caused by a long embedded foreign body, which was recently removed from the left bronchus.

ered as evidence of the presence of abnormal bronchial secretions, provided one can exclude an insufficient quantity of oil as a cause.

3. Sicard, J. A., and Forestier, Jacques: *J. de méd. franc. Paris* 13: 3-9, 1924.

4. Sergent, Emile, and Cottenot, P.: *Presse méd.* 33: 500 (April 18) 1925.

It is evident, then, that any pulmonary cavity can be shown roentgenographically if its bronchial outlet allows the inflow of iodized oil. We have not found occasion for injecting a tuberculous pulmonary cavity, but we have succeeded in locating the cavity of a foreign body abscess which, on the regular film, remained hidden (fig. 3.) This fact suggests that this procedure with serial oblique films might be a valuable aid in thoracic surgery. In the exploration of thoracic fistulas, the fluidity of iodized oil renders it superior to bismuth paste. Archibald⁵ has drawn attention to the value of this oil in demonstrating the persistence of tuberculous cavities and bronchial dilatations after thoracoplastic operations.

We find the injection of iodized oil of great value in patients presenting symptoms of persistent cough, occasional fever and expectoration free from acid fast bacilli. These patients complain of exhaustion and are underweight. Their cases are frequently diagnosed as tuberculosis, and the physical examination, laboratory findings, and roentgenologic study give no definite information as to etiology. The following cases will illustrate the point:

M. C., a man, aged 36, 5 feet 6 inches (168 cm.) tall, weighing 131 pounds (59 Kg.), with an average weight of 140 pounds (64 Kg.), was pale, was nervous, and tired easily. A chronic cough persisted for eight years, following influenza. The expectoration was scanty and revealed no acid fast bacilli or elastic tissue. At times the cough was increased in severity, and some slight degree of fever was present. The patient complained of a heavy dull pain under the middle of the sternum. He had been told that he had tuberculosis. After a careful physical examination, laboratory

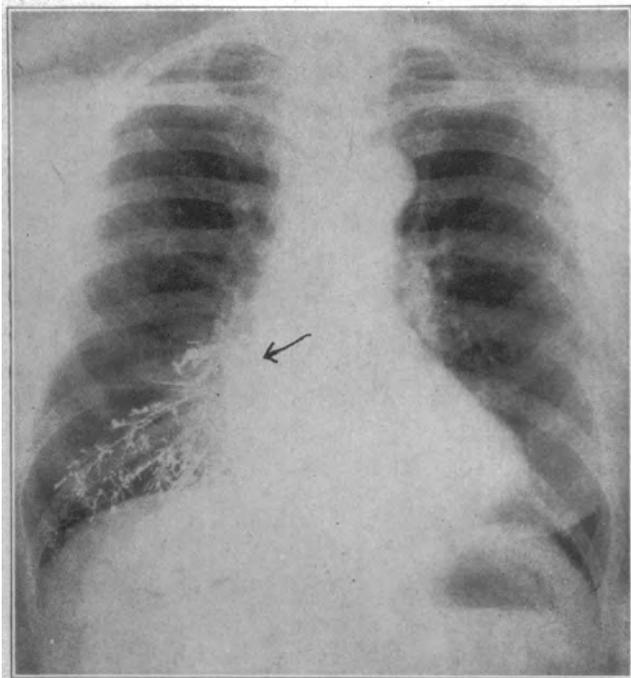


Fig. 4.—Large irregular bronchiectasis, not discovered until after the injection of iodized oil.

test and roentgen-ray study of the chest, no abnormalities were found, except rhonchi over the right lung root zone in the back. Iodized oil was injected into the right root and base, and a distinct bronchiectatic dilatation (fig. 2) was shown at the edge of the right lung root density. The patient was given

an injection of 10 cc., once a week for six weeks and, eight months later, he reported that since then he had had no cough or expectoration and felt well. The supraglottic method was used, and no local anesthesia was administered after the first injection.

10 gm *
40% = 4
gm!

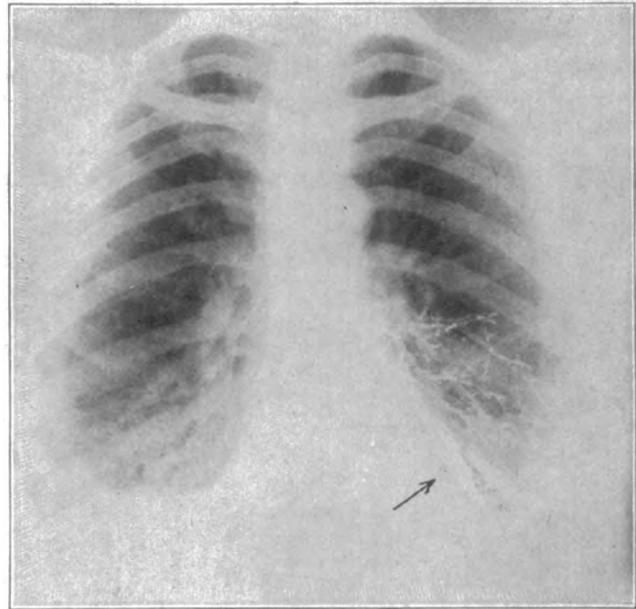


Fig. 5.—Cylindric type of bronchiectasis, revealed after the introduction of 15 cc. of iodized oil into the left lower bronchial tree.

M. K., a woman, aged 52, had had chronic cough, associated with about 10 to 20 cc. of purulent but odorless expectoration daily, following an acute bronchitis five years previously. No acid fast bacilli or elastic tissue was found (pig inoculation). There was no clubbing of the fingers, no loss of weight or history of fever. The patient complained of fatigue and of the annoying cough and expectoration. Physical examination and roentgenologic studies of the chest showed no abnormalities, except that the right root shadows were somewhat prominent. The nose and throat were normal. Twenty cc. of iodized oil was injected into the right lung root zone by the supraglottic method. A very distinct irregular bronchiectatic dilatation (fig. 4) was revealed in the inner right lung root zone, over which grouped râles were found, the result of the retention of the oil. This area was in all probability the seat of the bronchial affection; lack of drainage caused a persistent multiplication and accumulation of bacteria. Fourteen injections of 12 cc. of iodized oil were given this patient at intervals of not less than five days, the object in treatment being completely to fill the small bronchial dilatations. Five months after the last injection, the patient reported much less expectoration and only a slight cough.

M. P., a woman, aged 36, had had a cough since she was 18 years of age, following a severe attack of acute bronchitis. For the past twelve years, the cough had been loose, productive and became worse on lying down. The sputum was yellow, offensive and from 30 to 40 cc. in quantity daily; no acid fast bacilli or elastic tissue was found (pig inoculation). The fingers were definitely clubbed. The nutrition was good. There were occasional attacks of fever. For the past three years, the condition had been growing worse. Scattered rhonchi were heard on physical examination of the chest. Anterior and oblique stereoentgenograms showed no abnormal densities. The nose and throat were normal. Fifteen cc. of oil was injected into the right lung root and descending bronchial tree, with no signs of dilatation. Later, the left root and descending bronchial areas were injected, and a number of cylindrical bronchial dilatations were found (fig. 5). Sixteen injections of 10 cc. each were given over a period of eleven weeks. Four months after treatment, the patient

5. Archibald, Edward: *Canad. M. A. J.* 15: 1000 (Oct.) 1925.

showed a marked improvement. The sputum had greatly decreased in amount and was odorless. A slight cough remained, but the patient reported that she has never felt so well in years.

CONCLUSIONS

1. By the injections of iodized oil into the bronchial tree, small bronchiectatic dilatations in and around the roots of the lungs and cylindric fusiform enlargements of the descending branches may be revealed in many cases of chronic cough, which a previous exhaustive examination of the chest failed to show.

2. The entire bronchial tree cannot be visualized at one injection. Small sections should be injected at intervals until any abnormality is discovered or the entire field is studied.

3. The nose and throat should be studied in all cases. Bronchiectatic cavities occur as the result of chronic upper respiratory infections, and may continue to cause cough after the tonsils are removed or the sinuses drained.

4. In the majority of cases, we feel that the supra-glottic method of injecting the lung roots and descending branches of the bronchial tree takes less time, less anesthesia, is less worry to the patient and gives results quite as satisfactory as other methods.

5. It is not necessary to use extensive local anesthesia in the majority of cases.

6. In more than 600 bronchial injections of iodized oil, we have seen no ill effects in our patients. No cases of iodism occurred.

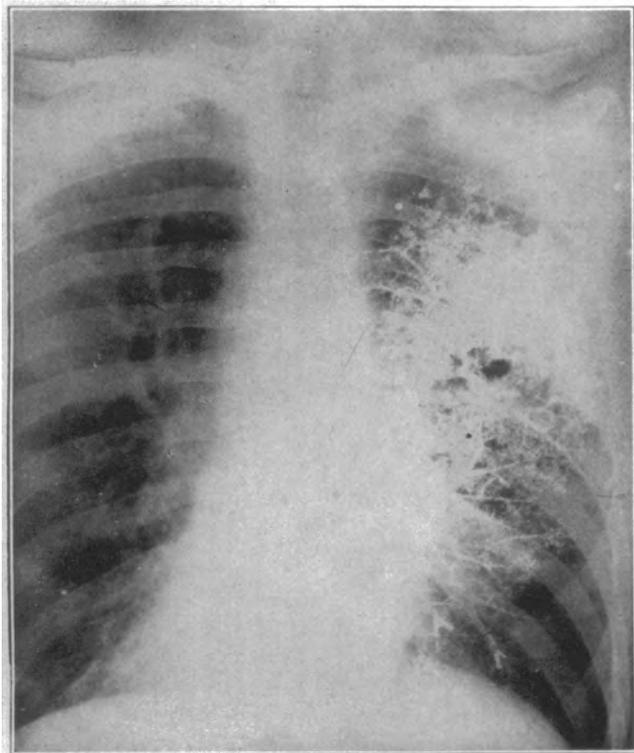


Fig. 6.—Result of an excessive amount of iodized oil obliterating the bronchial markings. Injection by the subglottic method.

7. The technic is not difficult. It requires no special training.

8. Negative results of an injection are no diagnostic proof that bronchiectatic dilatations do not exist.

9. The therapeutic use of iodine is not new but this compound of iodized oil is a new combination and, as

a result of the slow liberation of the iodine in the bronchial tree, acts as an ideal treatment in chronic affections of the lower respiratory tract.

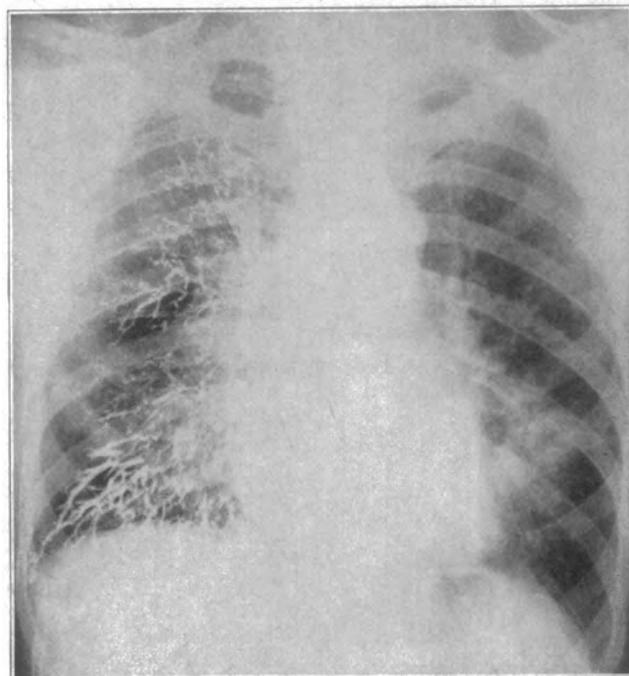


Fig. 7.—An evenly distributed injection of 25 cc. of iodized oil in the right bronchial tree, by the transglottic method duplicated later by supraglottic method.

10. In acute affections or pulmonary tuberculosis, we hesitate to inject iodized oil for either diagnostic or therapeutic purposes.

OMENTOPEXY IN CIRRHOSIS
OF THE LIVER

REPORT OF CASE

FREDERICK W. LESTER, M.D.

SENECA FALLS, N. Y.

Cases of atrophic cirrhosis of the liver are still sufficiently common to attract the surgeon's attention for the relief of the ascites. These patients with various complicated lesions, and with a shaky cardiovascularrenal tripod, do not make desirable operative risks, and careful judgment is advisable in their selection.

The temptation to relieve the accumulations of fluid in the abdomen by repeated paracentesis is one to which the physician frequently succumbs. That such treatment is without substantial avail has long been known.

Binnie, quoting Wynter, says, "The price paid for the relief of the distention is the sacrifice of so much nutrient fluid," and Osler confirms this, stating that "the average duration of life in atrophic cirrhosis, after the commencement of tapping, is about fourteen weeks."

Omentopexy, or epiploexy, known as Talma's operation, also termed Morrison's operation and Narath's operation, is a surgical procedure devised on a truly scientific basis, with the object of attempting to restore, at a single stroke, the normal function in an organ (the