Thorax (1946), **1**, 93.

RESIDUAL IODIZED OIL FOLLOWING BRONCHOGRAPHY

BY

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Residual oil in the bronchial tree following bronchography is always undesirable ; in excess it is evidence of poor technique and lack of attention to detail. Its presence leads to difficulty in diagnosis in cases suspected of tuberculous disease, and the fact that confusing radiological shadows may be produced is a deterrent to its use in established cases of tuberculosis. If lung resections for bronchiectasis are to be undertaken, a previous inadequate bronchogram which has left conglomerations of residual oil in the alveoli prevents effective re-investigation until the oil has cleared, and this may take many months. Belsey (1937) has pointed out the higher incidence of post-lobectomy atelectasis in patients who have residual lipiodol in the alveoli at the time the operation is performed, and Gowar's figures confirm this observation. Gowar's (1941) experiments led him to suggest that the sticking together of the alveolar walls by the oil was the factor responsible for post-operative atelectasis in cases with a free upper lobe.

Alveolar filling is a normal occurrence in a healthy bronchial tree, and the amount of oil which remains is a measure of the extent of alveolar fill obtained during bronchography. Ballon and Ballon (1927) observed that oil persisted longer in normal than in diseased lungs, and pointed out that alveoli do not fill in bronchiectatic segments. When alveolar filling has occurred, cough and posture have no effect on the oil, and this is due to the fact that once it has passed into the alveoli it is outside the range of the normal mechanism for cleansing the bronchial tree. These mechanisms are cough and ciliary action. The oil flows rapidly into the alveoli, and Bonnamour and Badolle (1929) state that if all the oil has not passed from the bronchi into the alveoli in fifteen minutes the former are abnormal, even though they do not appear dilated. Forestier and Leroux (1935), using the intranasal method, find that alveolar fill occurs from three to five minutes after the beginning of the injection of the oil. This is not true in all cases, because the rate of filling depends on the amount and temperature of the oil used. Not more than 10 c.cm. of oil should be used for each lung, but it is equally important to insist that this amount be evenly distributed throughout the bronchial tree and that no segment of the lung be overloaded. If the 10 c.cm. is injected into one segment or lobe, alveolar fill will be excessive in that part.

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I propose to describe a technique of bronchography which has been used successfully at Kewstoke Emergency Hospital, and which differs from the accepted methods in several particulars. Both lungs are filled at the same sitting, and little or no oil remains in the alveoli or the bronchial tree twenty-four hours later.

One hour pre-operatively, 1½–3 gr. of nembutal are given orally and the patient has half an hour of postural drainage before coming to the X-ray room. The crico-thyroid or crico-tracheal method is used in adults and, after local infiltration of the skin with novocain, ¾–1 c.cm. of 2 per cent amethocaine is injected into the trachea. Both lungs are filled at the same sitting, the diseased side first. Cold oil is injected slowly into the trachea while the patient's posture is changed to ensure even filling by gravity of all segments of one lung. The positions are those used at the Brompton Hospital (Foster-Carter, 1943). Lateral and antero-posterior films are taken after the withdrawal of the needle, and then the patient is instructed to sit up and expectorate as much oil as possible before the other side is filled. Radiographs can be obtained in less than two minutes, and without undue haste it should be possible to have the exposures made within three minutes of the time the injection of the oil into the trachea is begun. When the patient ceases to cough the other side is filled in a similar manner and oblique and antero-posterior views are taken. The patient then sits up again and is encouraged to cough and expectorate as much oil as possible. Provided the operator and radiographer are competent, there should be no need for the patient to suppress the cough reflex until the wet plates have been seen. This method contrasts with that advocated recently by Adams and Davenport (1942) in which the period of cough suppression is 15–20 minutes. The patient is then sent to the ward and is immediately tipped on a postural drainage bed for half an hour.

This technique has been checked in thirty-one adults by radiographs taken twenty-four hours later. In ten cases the oil had cleared completely from both lung fields, in nine there were traces of oil visible, in the remainder there was a moderate residue in one or both lungs. Most of these patients were suffering from unilateral bronchiectasis ; some had normal bronchial trees and some had bilateral disease. Where more than a trace remained, the oil, with two exceptions, was observed in normal lobes or segments in which alveolar fill had occurred. In nearly every case this was a lower lobe, and the upper lobe had not been well filled. In two the oil remained in bronchiectatic cavities, one being a case of bronchiolectasis and the other of " dry " bronchiectasis. In children to whom an anaesthetic had been given residual oil was noted in every case, even when the oil was well distributed ; but subsequent clearing appears to be more rapid in children than adults.

At the beginning of their researches Sicard and Forestier (1932), who used 40–60 c.cm. of lipiodol, observed that oil introduced into one segment of the lung was apt to be coughed into another. Ameuille (1924) noted filling of the right middle lobe and of the left lower lobe bronchi after the injection of lipiodol

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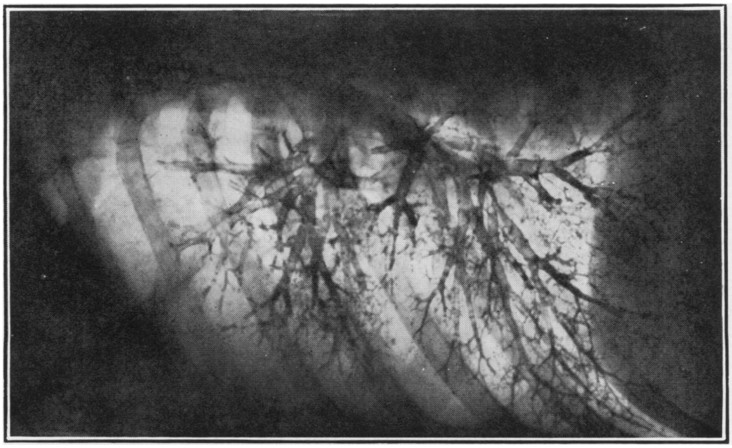

FIG. 1.—Case 1 (*Female—aged 32 years*). Bronchiectasis, left lower lobe and lingula. Normal right-sided bronchogram.

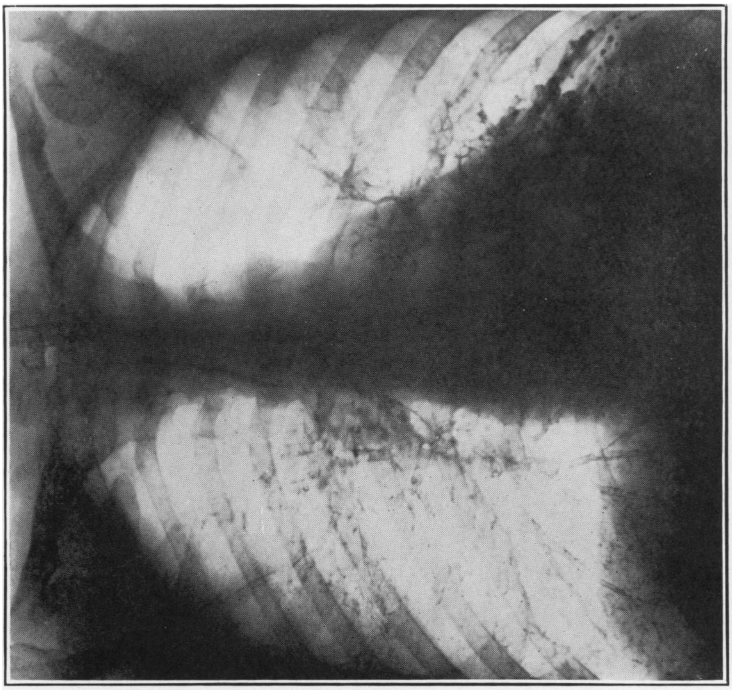

FIG. 2.—Case 1. *X*-ray taken a few minutes later; the patient cleared some of the oil from the right side by coughing, and the left side was then filled. This is a more penetrating film, but some of the oil has been eliminated from the right side.

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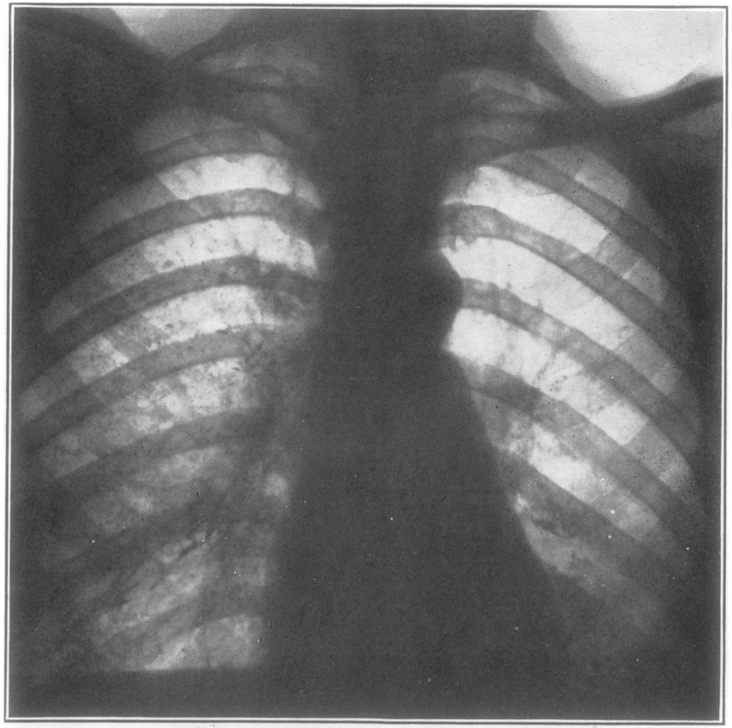

FIG. 3.—Case 1. *X*-ray after patient has coughed and tipped for half an hour, showing that almost all the oil has been expectorated.

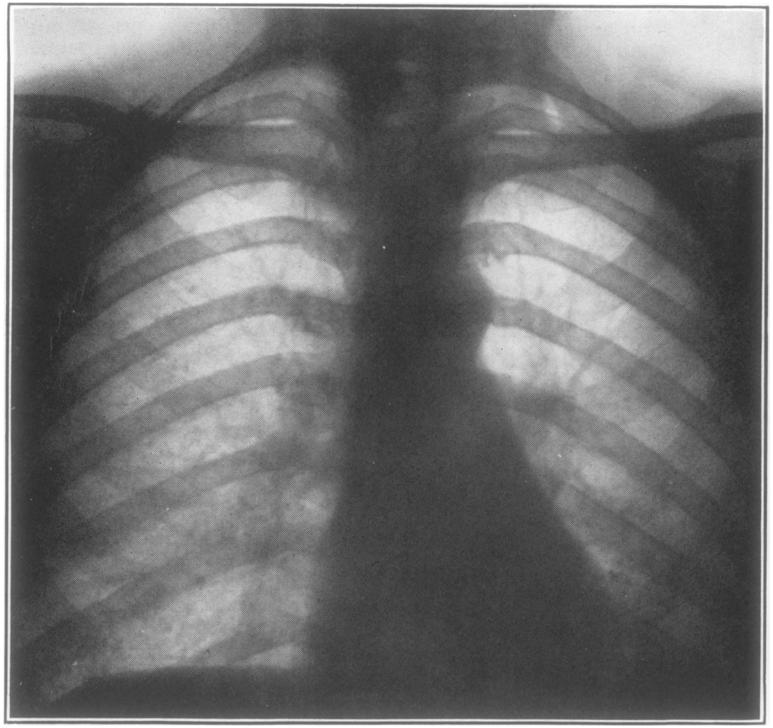

FIG. 4.—Case 1. Shows lungs almost completely free of oil twenty-four hours after the bronchogram.

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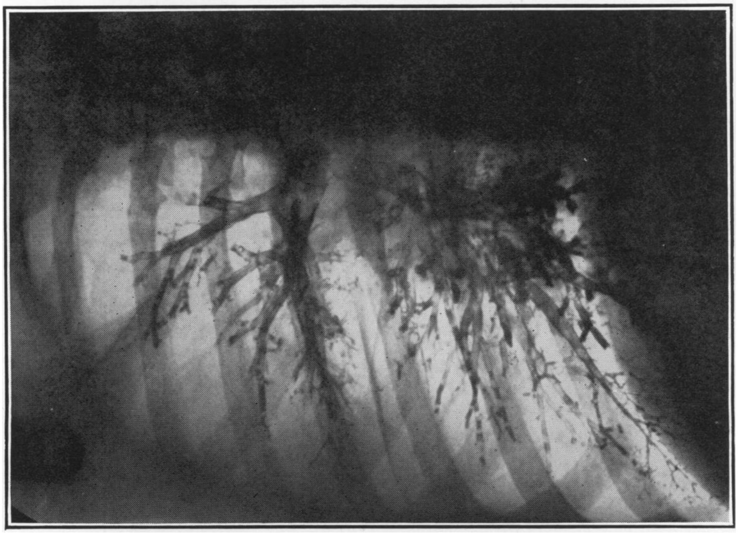

FIG. 5.—Case 2 (*Female—aged 18 years*). Saccular bronchiectasis of left lung with collapsed left lower lobe; 3 to 4 oz. purulent sputum per diem. Right-sided bronchogram showing fusiform bronchiectasis.

FIG. 6.—Case 2. Same case—a radiograph taken two minutes later, showing that much of the oil has been eliminated in this short interval by coughing.

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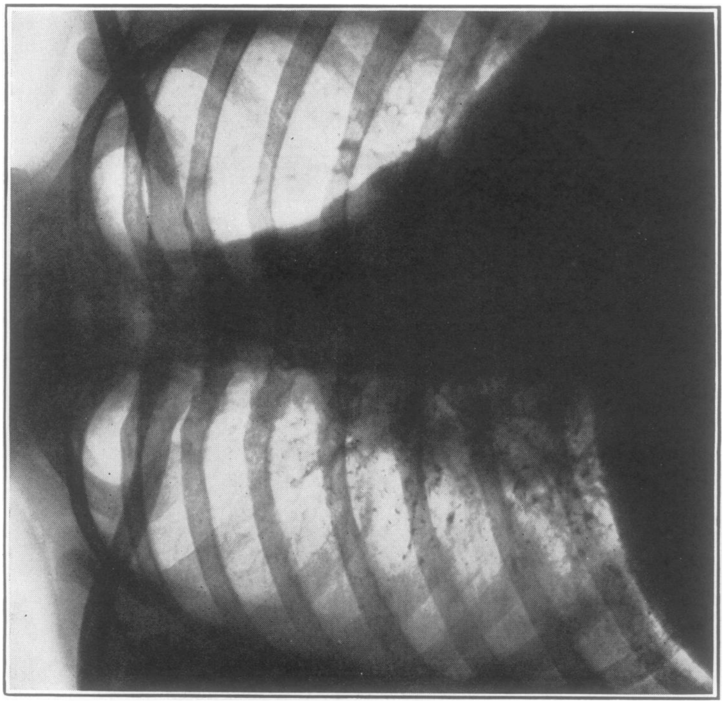

FIG. 7.—Case 2. Same case—a radiograph taken half an hour later, after patient had tipped, showing further clearing.

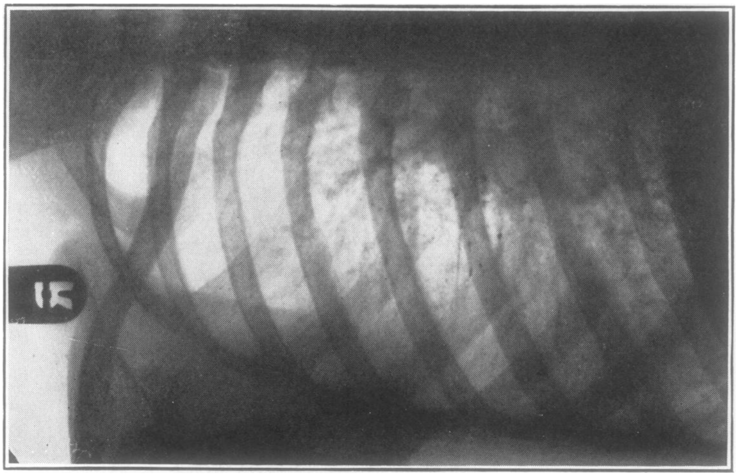

FIG. 8.—Case 2. Radiograph of same case twenty-four hours later.

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directly into a tuberculous cavity in the apical part of the right lower lobe ; this he attributed to coughing. Reinberg (1925) described how a bismuth mixture was disseminated by coughing after it had been injected into patients with bronchial fistulae. In no case was the influence of posture and gravity specifically excluded, and it is possible that the effects attributed to coughing were in fact due to gravity. It is difficult to see how material can be propelled by coughing from one bronchus to another, as this would involve the embolus finding its way " up-stream " against a strong air current.

It is of interest to note that in over a hundred bronchograms, using the technique I have described, spread of oil from one lung to another, or from one segment to another, by coughing has not been seen.

The technique described above involves a few simple modifications of the crico-thyroid method and can easily be adapted to intranasal methods. If a catheter is passed through the cords both sides must be filled before the patient is allowed to cough, otherwise the catheter will be coughed out. This involves a longer period of cough suppression.

Good filling of all lobes is the essential aim of all methods of bronchography, and the effort to avoid residual oil must be subordinated to this end.

SUMMARY

A technique of bronchography which permits examination of both lungs at one sitting and minimizes the amount of alveolar filling and subsequent residual iodized oil persisting in the lung is described.

I wish to thank Mr. R. H. R. Belsey for his help and the permission to reproduce the *x*-rays.

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