

## THE ANESTHETIST'S INTEREST IN LIPIODO-BRONCHOGRAPHY \*

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BRONCHOGRAPHY was first introduced by Sicard and Forestier in 1921 (1). Lipiodol is a compound of iodine in poppyseed oil, containing 40 per cent iodine, and it is considered non-toxic. Instillation of lipiodol into the tracheo-bronchial tree will often aid in the roentgenologic visualization of many interesting pathologic conditions. The most important and the most common conditions that are demonstrated are bronchiectasis, pulmonary abscess, primary carcinoma of the bronchi, tumors of the pleura and the presence of a foreign body.

The contraindications to the injection of lipiodol may be summarized as follows: If the patient is in poor physical condition the injection should not be attempted. The presence of active pulmonary tuberculosis is a definite contraindication. When hemoptysis has occurred recently, the injection should be deferred for eight or ten days. Lastly, an idiosyncrasy to iodine constitutes a definite contraindication to this procedure.

The pulmonary alveoli have a remarkable tolerance for lipiodol. Instillation of this substance does not cause dyspnea, pain or spasm of the bronchial musculature. The only discomfort which the patient is likely to experience is that which is caused by coughing. Eighty per cent of the lipiodol which has been injected into the tracheo-bronchial tree will be expectorated within three or four hours after the injection. The remaining 20 per cent will usually be destroyed by fat splitting enzymes and absorbed by the pulmonary cells.

A thorough knowledge of the anatomy and relationships of the various bronchi is essential if bronchial catheterization is to be accomplished with ease. From the upper teeth to the glottis the average distance is 15 cm. The trachea is 12 cm. long. From the carina to the bronchus leading to the right upper lobe the distance is 2 cm. The bronchus to the right upper lobe comes off in a lateral direction from the main stem. From the carina to the bronchus of the right middle lobe the distance is 5 cm. and the bronchus to this lobe comes off from the right main stem somewhat anteriorly. The bronchus to the right lower lobe is a continuation of the right main bronchus. The entrance to the bronchi of the left upper and left lower lobes is approximately

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5 cm. from the carina. The left upper bronchus branches off in a slightly anterior and superior direction while the left lower bronchus is somewhat posterior and inferior. The right main bronchus makes an angle of about  $20^\circ$  with the midline while the left main bronchus makes an angle of approximately  $40^\circ$  with the midline.

The several methods used for lipiodo-bronchography are the supra-glottic or laryngeal, the nasal, the transglottic, the subglottic or inter-ericoid and the bronchoscopic. The first three methods are the most popular. Rudman (2) describes a method of bronchial catheterization in which he anesthetizes the pharynx, pyriform fossae and vocal cords with larocaine in 2 per cent concentration or nupercaine. The catheter is threaded on a stylet and is inserted under direct vision, the operator using a head mirror. Insertion into the various bronchi is dependent upon a knowledge of the distance of the bronchial openings from the glottis. Ellman (3) has described a technic in which injection into the nostril, with or without preliminary anesthesia, is performed. A nasal catheter is not required. Gosselin and Perron (4) describe a similar method with or without anesthesia for which they claim excellent results. Randolph (5) has employed the supraglottic technic for about twelve years and has found it most satisfactory. He claims that by tipping the patient the oil can be made to gravitate into the desired portions of the pulmonary tree, and that after the lower lobes have been visualized it is possible, by changing the patient's posture, to cause the oil to flow into other parts of the lung. Employment of the ericothyroid route is not without danger and this method is used little at the present time.

The laryngeal or supra-glottic method, i.e., the instillation of the lipiodol through the glottis by means of a syringe with a curved tip has been criticized unduly. Claims have been made that the procedure was difficult because of the need of using a laryngeal mirror, and because the procedure was dependent upon the patient's good behavior. The method which I wish to describe is one which combines features of the various technics described in the literature. It is the standardized technic which has been employed at the Hartford Hospital for the past two years. The results obtained with it have been most gratifying to the roentgenologists, the internists, the surgeons and the patients.

Each patient is seen preoperatively and an evaluation is made regarding his physical condition. Proper preliminary medication is essential, not only to allay fear, but also to diminish the pharyngeal and laryngeal reflexes. The drugs that are employed for this purpose are morphine sulphate, atropine sulphate and a barbiturate such as nembutal or seconal. The patient should not be depressed by the medication to the point where he is incapable of cooperating with the operator. Placing the patient in a position for postural drainage for ten minutes prior to the administration of the sedatives is beneficial. Food should be withheld four hours prior to the procedure.

The pharynx is anesthetized by spraying with pontocain in 1 per cent solution. A cotton tampon wound on the tip of a laryngeal forceps is saturated with the same solution and the excess is expressed. The tampon is passed over the dorsum of the tongue, along the lateral pharyngeal wall, down and into the pyriform fossa on each side. Due to the superficial position of the superior laryngeal nerve in this location it is easily anesthetized by this procedure. Then the forceps are passed in similar fashion over the dorsum of the tongue, in the midline, until the epiglottis is reached. It is allowed to slip over the epiglottis and to fall into the glottis, there anesthetizing the mucous membrane of the vocal cords. Finally, 2 cc. of the solution is instilled into the trachea by passing the tip of the laryngeal syringe over the dorsum of the tongue to a position above or between the vocal cords. Following the instillation into the trachea, after a lag of from two to three seconds, the patient will cough. This reflex coughing is due to the solution reaching the bifurcation of the trachea. If this cough is not elicited, it is likely that the solution has been diverted into the stomach.

It is only in the rare instance that one should fail to accomplish satisfactorily the injection on the first attempt. After the patient is placed in a sitting position on the fluoroscopic table, warmed lipiodol is injected as the roentgenologist directs. The patient's posture is changed in order to fill different portions of the bronchial tree. In order to introduce the lipiodol into the upper lobes and occasionally into the right middle lobe, it may be necessary to catheterize and instill the substance directly into these bronchi. Various catheters for this purpose have been described, but the Thompson (6) endobronchial catheters have proved most satisfactory.

Due to their flexibility, the catheters must be guided into the glottis. One of four methods may be employed to accomplish this. Robson describes a method of introducing an intratracheal tube in which he picks up the epiglottis with his middle finger and slides the tube along the groove between the middle and index fingers. This method can be used if the operator's fingers are long enough and if the epiglottis is not too deeply situated. Another method which may be used is that in which the catheter is threaded on a stylet and then introduced in the same manner in which the syringe tip is introduced when the pontocain solution is instilled into the trachea. The stylet is removed when the tip of the catheter has been placed between the vocal cords. In contrast to the methods just described—so called blind intubations—the other methods are by direct vision. The larynx is exposed by using a laryngoscope, and the catheter, threaded on a stylet, is inserted. The stylet is then removed. As an alternative, an intratracheal tube may be inserted and left in situ. The catheter can then be introduced with ease through it.

With the aid of the roentgenologist it is not a difficult procedure to place the tip of the catheter in the desired bronchus. For this proced-

ure it is essential that anesthesia of the tracheo-bronchial tree be complete. After introduction, the catheter should be disturbed as little as possible in order to obviate a cough reflex. With adequate knowledge of the anatomy of the tracheo-bronchial tree and with proper selection of the catheter, the introduction of lipiodol may be made a rather simple procedure.

A total of from 10 to 20 cc. of lipiodol is required to provide satisfactory contrast. The entire procedure should take no longer than one-half hour. If the anesthetist is thorough and if the procedure is performed with gentleness and skill, the patient suffers little or no discomfort or fatigue.

#### SUMMARY

A field for cooperation between roentgenologists and anesthetists has been outlined. Contraindications to employment of lipiodol for roentgenologic visualization have been enumerated. A simple method for the instillation of lipiodol into the tracheo-bronchial tree has been described.

#### REFERENCES

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3. Ellman, P.: Introduction of Lipiodized Oil into the Tracheo-Bronchial Tree, *Lancet* **1**: 448-450 (Feb. 25) 1939.
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6. Thompson, S. A.: Bronchial Catheterization, *Am. J. Surg.* **31**: 260-264 (Feb.) 1935.

#### MEETING OF THE AMERICAN SOCIETY OF ANESTHETISTS, INC.

SQUIBB BUILDING, 745 FIFTH AVENUE, NEW YORK CITY

February 12, 1941—7:30 P.M.

1. Intractable Pain—50 Minutes.  
By William Bates, M.D., Professor of Surgery, Graduate School of Medicine, University of Pennsylvania, Philadelphia, Pa.  
Discussion to be opened by E. A. Rovenstine, M.D., New York City.
2. Continuous Spinal Anesthesia—A Report of 400 Cases. Lantern Demonstration—30 Minutes.  
By Virginia Apgar, M.D., Director of Anesthesia, Presbyterian Hospital, New York City.  
Discussion to be opened by Leo V. Hand, M.D., Boston, Mass.