The Surgical Treatment of Pulmonary Tuberculosis

The evolution of surgical methods to furnish added rest to the lung still remains the foremost advancement in the treatment of pulmonary tuberculosis. Through this intermedium, it is possible to retrieve many cases believed incurable because of extensive invasion of the disease.

Obviously, routine sanatorium care alone is an insufficient combative measure for patients who have progressed to the stage of cavity formation, where the possibility of infection to the opposite lung, throat, or intestines may render the case beyond all hope of reparation. The methods of recognized merit for providing additional rest to the lung, aside from bed and postural rest, are included under "collapse therapy"—those of paramount importance being artificial pneumothorax, intrapleural pneumolysis, phrenic neurectomy and thoracoplasty.

Artificial Pneumothorax

Artificial pneumothorax is the most universal method of compressing the lung, but owing to pleuritic adhesions, it is availing in less than one-half the cases where indicated. We have treated over 1700 patients by this method during the past 25 years; these were comprised mostly of stage III cases, of whom nearly 50 per cent were rehabilitated. With the regular sanatorium routine of care alone, probably not over 5 per cent would have recovered.

Intrapleural Pneumolysis

If pleuritic adhesions are hindering the lung collapse, the closed method (intrapleural pneumolysis) of severing them should be considered, after a three to five months trial of artificial pneumothorax. I do not recommend the stretching of adhesions, as tears may result in spontaneous pneumothorax and empyema. Empyema is also a very common complication of extrapleural pneumolysis (open method), which I do not uphold.

Intrapleural pneumolysis, when properly performed, is scarcely more discommoding to the patient than aspirating fluid from the pleural cavity,—neither is it shocking, and it is seldom painful. Often a cavity that has been open for months (sometimes years) closes within a few weeks and expectoration ceases following this operation; hence, in many instances other more radical surgical procedures are unnecessary. For cutting adhesions we prefer the Bovie high-frequency unit, employed according to my technic, which has been previously described at considerable length. By this method the incidence of empyema is less than 2 per cent, while it is approximately 20 per cent with the galvanocautery.

In our series of 250 cases operated upon, approximately 60 per cent were technically and clinically successful. The unsuccessful cases comprise those where adhesions were found unsuited for operation.

Following operation, exudate will occur in the pleural cavity in about 3 per cent of the cases, and empyema in less than 2 per cent. We have had no deaths directly due to operation.

Phrenic Neurectomy (Phrenicotomy)

When the surgeon is confronted with an unsuccessful pneumothorax and inoperable adhesions, phrenic neurectomy should be undertaken. The phrenic nerve is exposed through a 2 cm. incision made above the clavicle in the subclavian triangle. It is sectioned and 8 to 10 cm. of the distal part extracted. The operation is performed under local anesthesia.

Because of the ensuing paralysis following phrenic neurectomy, the diaphragm gradually rises into the chest, reducing the lung correspondingly in size; thus,
even apical cavities often close after this simple procedure.

In our series of over 500 phrenic operations, more than 15 per cent of cavity cases have healed, thus excluding more radical measures. The indications for phrenic neurectomy cannot be individualized in this publication, but the most important ones are as follows:

1. In pulmonary tuberculosis where artificial pneumothorax is indicated but introduction of air is thwarted by pleuritic adhesions.

2. As an accessory to artificial pneumothorax where a suitable lung collapse is prevented by adhesions inappropriate for operation.

3. In tuberculous empyema to reduce the size of the pleural cavity and lessen the area of infection.

4. As a preliminary to every thoracoplasty to serve as a test of the soundness of the opposite lung, as well as to reduce the amount of rib necessary to be removed. Often a thoracoplasty is needless after this procedure, or, if necessary, the patient is made a better surgical risk. Ordinarily, three to five months should elapse after a phrenic neurectomy before a thoracoplasty is decided upon, as that length of time will determine its value.

**EXTRAPLEURAL THORACOPLASTY**

When the above measures to secure sufficient lung collapse have proved disappointing, a paravertebral extrapleural thoracoplasty should be considered. Next to artificial pneumothorax, it is the most valuable method of collapsing the lung; but contraindications for operation are more stringent for thoracoplasty than artificial pneumothorax. Poor surgical risk cases must be excluded; also, disease in the opposite lung must be of minimum extent and absolutely quiescent or healed.

In a unilateral pulmonary tuberculosis—preferably of the fibroid type, with or without cavity formation—thoracoplasty is indicated provided artificial pneumothorax and phrenic neurectomy have been given a trial and proved unsuccessful.

Before operation, the patient is specially prepared, including the psychic preparation; he is assured that the operation is not dangerous, painful, nor mutilating when properly performed.

The operation is, preferably, performed under light ethylene anesthesia, combined with local anesthesia. A complete thoracoplasty must be done in two or more stages, depending upon the case. The ribs are sectioned close to the spine, and in some cases of limited upper lobe disease, the resection of the upper five or six ribs only may suffice. If large cavities exist in the upper lobe, it is advisable to sever the anterior portions of the upper four or five ribs near the sternum, an incision being made from the axilla downward. Owing to the brief period required for osteogenesis, the second and, if necessary, subsequent operations should follow the first as soon as possible before this formation, as rigidity of the chest wall interferes with the collapse. To restore shoulder movement and prevent deformity, shoulder exercise and rest in a thoracic hammock are carried out as soon as possible. Following operation, three months rest in bed is obligatory. The final outcome will depend greatly upon the after-care; therefore, it is essential that only nurses who understand both the medical and surgical treatment of tuberculous patients be in attendance.

**RESULTS**

In our series of 150 thoracoplasties, upon whom 355 operations have been performed, the total recovery was 66.1 per cent; the total dead, 21 per cent. But, only 1.53 per cent (2 cases) died from causes directly due to operation. Death in the other instances was caused by intercurrent disease, progressive tuberculosis in the intestines, in the same lung, or, in some cases, in the opposite lung.

I have previously stressed the prime importance of a background of experience and special training in tuberculosis before attempting these operations, but when that is attained, they are not difficult to execute and should be utilized to the limit of their indications.