

EMPYEMA *

EXPLORATION OF THE THORAX WITH PRIMARY MOBILIZATION OF THE LUNG

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For many years the approved operative treatment of pyothorax has been by drainage more or less perfect through an incision with the removal of short sections of one or two ribs.

Seldom has there been any effort to determine or treat the primary cause of the condition, empyema being too often regarded as itself a disease instead of as a phenomenon resulting from some other process. Doubtless we have frequently missed the superficial lung abscess, the remote septic focus or even the adjacent subdiaphragmatic infection.

Also, the mechanical problems arising from adhesions and sacculations have not often been investigated on the table at the primary operation. Because of tradition we have been satisfied with unsurgical incision without proper inspection and usually with the merest pretence of digital exploration. A mortality of 25 per cent. or more with about 23 per cent. of secondary operations (Wilensky, *Surg., Gyn. and Obst.*, vol. 20, No. 5) and a large proportion of the cases ending in permanent fistulae or, despite the hazard of repeated operations, in unsightly or even disabling deformities—these surely are not pleasant things to contemplate in the days of modern progress and enlightenment.

And the patients often enough remain in the hospital for weeks and months, long outstaying their welcome as "interesting cases."

Lloyd (*Ann. of Surg.*, vol. xlv) has suggested the systematic exploration of the chest during the primary operation for empyema to seek the cause, the complications and the remedy of the disease. He made a long stride in the right direction when he advocated freeing the lung from its adhesions (Delorme, Fowler, Ransohoff), but he accomplished this with the help of multiple rib resection, a procedure of magnitude and danger. There is also much hemorrhage during the separation of the lung from the chest wall. His results, however (20 per cent. mortality), were better than those of his predecessors.

A little more than a year ago I began to study the problem of non-tuberculous suppuration within the pleura and made a preliminary announcement (*N. Y. Med. Jour.*, January 30, 1915). The present paper is to report progress after a year's work.

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The first step was to apply a rational technic which should make possible a more accurate knowledge of the pathological anatomy of empyema in the living.

In my other intrathoracic work I had noted the wonderful exposure afforded by wide rib retraction through a long intercostal incision, and I adopted this operative principle as a primary evolutionary move with the provision, however, that it might be necessary in some cases to make it actually the second step of a two-stage operation, applying the good surgical motto of "safety first."

In treating pyothorax a cure is to be striven for in the shortest time and with the fewest operations.

There are two important objects: (1) exploration of the pleural cavity and (2) mobilization of the lung.

In critical cases a small incision between the ribs for relief only should precede the radical operation by one or by several days.

Exploration.—A transpleural incision is made in the seventh or eighth interspace close to the upper border of the rib from the angle almost or quite to the cartilage. Part of the latissimus dorsi and serratus magnus muscles must be divided and in the adult such an incision may be eight or nine inches long. Preferably local anæsthesia is employed up to this point, to be followed now by nitrous oxide and oxygen. Ether had better be avoided, owing to the danger of irritating an already diseased lung.

The mechanical rib-spreading retractor is then placed in position. This instrument will widen the intercostal space to four inches or more, permitting a thorough inspection of most of the interior of the thorax. The intrathoracic procedure will depend upon what is disclosed at this exploration. A bulging and rigid diaphragm, for instance, may suggest a complicating subphrenic abscess and puncture here may lead to an incision and evacuation.

Many other conditions might be enumerated, but for the sake of simplicity let us assume that we are dealing with a recent metapneumonic empyema or perhaps with one in which the pulmonary disease has not yet entirely abated. If we suspect an active pneumonia and if a tense pyothorax urgently demands intervention a tiny intercostal incision will temporarily relieve the patient and may even permanently cure the disease. The mere fact, however, that pus has been found on aspiration does not of itself mean that immediate radical operation is called for. Sometimes a delay of a few days with no operation will give time for a more complete resolution of the pneumonia.

Exploring in the early cases we may exceptionally find the lung truly



FIG. 1.—Rib retractor in place. Knife incising pleural exudate.

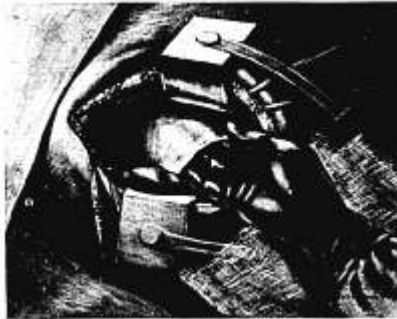


FIG. 2.—Stripping exudate from pleura. Lung bulging below.



FIG. 3.—Lateral incisions made with scissors. Lung bulging out. Part of this exudative membrane may be cut away.

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free and its fissures visible. If so we need but remove the loose flakes of fibrin and close the chest in the manner to be described farther on.

Perhaps the lung is free everywhere except over the surface of the diaphragm where the lower lobe adheres. As Lloyd has noted, it may be quite difficult to mark the place where the lung and diaphragm meet. Gently peeling this adhesion away we may come upon a sacculatation of pus which doubtless would have made trouble had it remained undiscovered. Or perhaps a tender adhesion toward the mediastinum covers a pocket of pus, often different in appearance and consistency from that in the general cavity.

The lobes should now be carefully separated to look for purulent collections.

Sacculations of intrapleural pus are apt to become rapidly surrounded by rigid and dense adhesions and these cavities if not evacuated early will collapse slowly or not at all. This tendency of pleural exudates to become thick and of cartilaginous rigidity forms the most cogent argument for timely lung mobilization. A description of the method follows.

Mobilization of the Lung.—As early as ten days—perhaps sooner—after the probable beginning of the empyema it may be found on inspecting the opened chest that the pleura is covered by a grayish or greenish uniform membranous exudate which obliterates every landmark. The chest cavity may not show even a bulging to indicate the location of the lung as it lies compressed against the mediastinum, the spinal column or the chest wall. These are the cases which, treated by the old methods, would be followed by delayed healing, by fistulæ, or by contractures of the thorax.

Before proceeding to the next step all bleeding points must be secured so that the wound is dry. After wiping away the pus and loose fibrin we may incise the fibrinous coating of the pleura with the scalpel under visual guidance from near the apex to the base (Fig. 1). There should be no bleeding from this incision unless the lung itself has been superficially wounded—not a dangerous accident. Now find the plane of cleavage and carefully separate the plastic material from the viscus with the fingers, the dorsal surfaces next to the lung (see Fig. 2). When this has been accomplished as far as possible it will be necessary to make lateral deep cuts into the loosened membrane with the scissors so as to free the lung more completely (Fig. 3). The tissue is not vascular and will bleed little if any and the lung will bulge out through the opening made in its retaining membrane. Such flaps of exudate as can be easily reached may be removed.

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At this point I call attention to the dangerous hemorrhage which may follow the tearing away of tough adhesions *between the lung and the chest wall*. It is therefore urged that as a rule these adhesions be not disturbed except in early cases when they are very soft. The lung mobilization will be just as well accomplished if the plastic visceral covering is peeled away; and the loose flaps of this membrane on complete expansion of the lung will later become adherent to the costal pleura. During this part of the operation sacculations, if present, will be discovered and may be evacuated.

In the left chest the pericardium must be guarded from trauma. Even during the retraction of the ribs tearing of this structure when covered by adherent thickened and inelastic membrane is a conceivable accident, though it has not occurred in any of my cases. In the low incision the diaphragm, too, may be torn by the retractor or it may be wounded in too violent efforts at freeing the lung. The rent should be repaired and a packing of gauze laid over the place.

The intrathoracic work completed, the retractor is removed, and it will be found that the ribs remain apart in the adult two inches or more. I have found it advisable not to draw them together by pericostal or percostal sutures, but merely to approximate with catgut stitches the latissimus and serratus. This will draw the ribs together to a certain degree, but not enough to interfere with drainage. The skin wound is closed with silk except at the point, usually in the midaxillary line, where drainage is to be provided. A short tube, or two or three, may be used to promote drainage but often the opening itself will suffice without tubes. The ribs will come together in from five to ten days.

After-treatment.—Immediately after this operation some shock may be expected but in my cases it has invariably yielded to a small dose of morphine or codeine.

During convalescence the patient seems to experience greater comfort on moving about than there is when ribs have been resected. Open air treatment is of the greatest value.

It is necessary to expand the lungs by blowing exercises or by straining with the glottis closed so as to prevent the formation of sacculating adhesions, and these exercises should be begun as soon as possible after the operation. Should a sudden rise of temperature indicate retention the thorax may be explored with the finger or with a sound and evacuation secured. I have found the suction apparatus most useful in treating these patients. It should be attached to a tube draining the thorax and should be used at least half an hour at a time, twice or thrice daily. There are various forms of apparatus. I have used an electric vacuum cleaner, a water air-pump and a combined

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electric pump and vacuum tank. The pump and vacuum tank arranged for graduated suction has given the greatest satisfaction. In Mt. Sinai Hospital the apparatus is installed in one of the examining rooms and the patients are taken there for suction treatment. In only one of my cases was a counterincision necessary and this might have been avoided by a more timely post-operative exploration before the adhesion had become too firm.

Infection of the wound may naturally be expected in these cases. This has not led to serious complications since drainage is so free.

The procedure as here described is the typical method of operating, but it must not be assumed that no departure from it is to be permitted. On the contrary, as in all branches of surgery, each case must be treated according to its conditions. It may after all be necessary in special cases to separate tough adhesions between lung and chest wall or it may be considered wise in a given case to resect a rib. What I have described is the procedure in an ordinary case. My whole contention is for rational modern surgery in the treatment of thoracic empyema.

After a trial of more than one year, although the number of cases is not large, I feel that I can conscientiously advocate this operation. Those who have seen it and who have followed the cases have said that they were impressed by its elements of safety combined with thoroughness.

I can report on but 23 cases operated upon by this method between April 27, 1914 and May 30, 1915.

All of these excepting one were nontuberculous empyemata.

Twenty-one were operated upon by me and two by Dr. Martin W. Ware.

Of these 23 patients, 4 are still in the hospital but may be considered convalescent. Four died, 17 per cent.

Of the patients discharged from the hospital all are well excepting one—the tuberculous case which is unhealed.

There were 20 one-stage operations and 3 two-stage operations. None of the two-stage cases died.

There have been no thoracoplasties.

The oldest patient was fifty-three years old and the youngest sixteen months, the average age being about sixteen years.

Bacteriology recorded in 16 cases was as follows:

Staphylococcus aureus	3
Pneumococcus	8
Streptococcus hæmolyticus	4
Tuberculosis	1

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DEATHS.

J. P., a man of thirty-nine (Bellevue), left empyema, died of acute pneumonia of the entire right lower lobe, which came on seven days after the operation and killed in twenty-four hours.

B. T., a girl of three and a half years (Mt. Sinai), left empyema, streptococcus hæmolyticus, died six weeks after the operation of pneumonia of the left apex.

J. S., a man thirty-five years of age (Mt. Sinai), had gangrenous left-sided pleurisy and streptococcus pyopneumothorax and was in an almost moribund condition. Died a few hours after operation.

N. T., a boy aged two years (Mt. Sinai), right pneumococcus empyema. Died six weeks after operation of a slow sepsis. Unfortunately no autopsy.

It is, of course, impossible to draw any except the roughest conclusions from such a small number of cases. At the same time it is hoped that other surgeons may become interested so that the method may receive a wider trial.

When a sufficiently large number of cases are available another report will be made by the writer with the collaboration of his associates of the First Surgical Service of Mt. Sinai Hospital, Dr. Joseph Wiener and Dr. Martin W. Ware.