The Management of Tuberculous Empyema*

JAMES D. MURPHY, M.D., F.C.C.P.**
Oteen, North Carolina

Tuberculous empyema is usually caused by rupture of a subpleural parenchymal focus through the visceral pleura. The immediate result of such a rupture is the occurrence of hydrothorax, the so-called idiopathic pleural effusion. In most instances, particularly with adequate drug treatment, the site of rupture seals. The fluid is then absorbed or removed by thoracentesis and the lung re-expanded, usually with little residual evidence of parenchymal disease. Too often, however, the bronchopleural fistula remains open and the hydrothorax converts into pyothorax, either pure tuberculous or mixed. The scene is then set for the tragic course which in 1915 caused Robinson to designate tuberculous empyema as the "Patriarch of the Surgical Scrap Heap."

The occasional demonstration of acid-fast organisms in the bone marrow, or of miliary tubercles in the liver, of patients with tuberculous empyema has been cited by some as evidence that the initial pleural effusion is only one phase of a tuberculous bacteremia which results from a lympho-hematogenous progression of a primary pulmonary focus.

These bone marrow and liver signs may be explained on a purely arithmetical basis. As long as the lesion is confined to the pulmonary parenchyma the lymphatic drainage is restricted to the hilar nodes and the chance of progression to the thoracic duct and the systemic circulation is small (Fig. 1). When, however, the lesion ruptures into the pleural space the possibility of lympho-hematogenous extension is increased (Fig. 2). In addition to the hilar nodes, the pleural lymphatics also drain through the paravertebral, the paraaortic and parasternal lymph plexuses. There are thus four times as many opportunities for pleural infection to reach the systemic circulation as when the infection remains restricted to the parenchyma.1 It is not surprising, therefore, that one is occasionally able to find lesions in the bone marrow, spleen, liver or kidneys in patients with tuberculous empyema.

Auerbach's2 demonstration of a bronchopleural fistula in 49 per cent of 311 autopsies done in patients who died with tuberculous empyema would seem to be conclusive evidence as to its pathogenesis.

Once empyema is established, a serious threat to the patient's life is presented. We are all too familiar with the chain of events; sepsis, amyloidosis, progressive tuberculous pulmonary fibrosis and insufficiency, which exacted such a toll in pre-chemotherapy days. Physicians often differed as to the best method of treatment of this serious condition but there was little difference of opinion as to the high morbidity and mortality rates that were encountered.

The mortality rate for pure tuberculous empyema ranged from 70 to

*From VA Hospital, Oteen, North Carolina.
**Presently, Manager, VA Hospital, Baltimore, Maryland.

658
90 per cent when treated only with thoracentesis and irrigation. If thoracoplasty was done, the mortality rate of 15 to 40 per cent was still forbidding. In patients with mixed empyema the rates were even higher.

The few who recovered after numerous stages of thoracoplasty and repeated chest wall excisions were left with such a skeletal deformity and reduced pulmonary function that life held few remaining compensations.

When streptomycin was introduced in 1946, efforts were directed toward reducing the hazards of empyema through its use. The Veterans Administration-Armed Forces Cooperative Conference drew up protocols under which alternate cases of tuberculous empyema were treated either with parenteral and intrapleural streptomycin, and irrigation, or with simple irrigations without streptomycin. The failure of streptomycin to significantly reduce mortality rates was often attributed to the fact that the Ph of the pleural fluid was too low or too high, according to one's opinion as to the acidity or alkalinity of the pleural exudate.

After two years of effort, the Conference realized that pyrothorax was usually the end result of an uncontrolled pulmonary lesion and not a disease entity. Treatment directed only toward sterilizing the pleural cavity, therefore, could only result in failure. The empyema protocols were then abandoned and efforts directed toward control of the pulmonary lesions and a more definite surgical approach when faced with an established empyema.

This method of attack has resulted in marked decrease in the incidence of empyema just as it has in all forms of extrapulmonary tuberculosis. When, however, empyema does develop management of the patient must be carefully planned if we are to prevent the unhappy sequence of events described above.

**FIGURE 1**
Figure 1: Lymphatic Drainage when Tuberculous Lesion is Restricted to the Pulmonary Parenchyma (Courtesy W. W. Stead, M.D.)

**FIGURE 2**
Figure 2: Avenue of Lymphatic Drainage when Parenchymal Lesion Ruptures into the Pleural Space (Courtesy W. W. Stead, M.D.)
The best treatment is prophylactic. Early diagnosis of pulmonary tuberculosis followed by prolonged, continuous treatment with one of the effective drug regimens will continue to result in a decreasing incidence of pleural infections. The incidence of empyema resulting from a complication of pulmonary resection can be further reduced by adequate pre-and postoperative chemotherapy and timing of the operation so that the maximum degree of stability of the parenchymal lesion will have been attained prior to surgery. When it becomes necessary to resect in the presence of an open cavity and positive sputum, the complications are definitely increased. It is not necessary to emphasize here the necessity for painstaken surgical technique and alert pre- and postoperative supervision. Of paramount importance is the early elimination of any postresection intrapleural air space.

When empyema has developed the situation is emergent and active measures are required if catastrophe is to be prevented. There are several objectives which must be satisfied if success is to crown our efforts. Among these are; elimination of toxicity, stabilization of the disease process and obliteration of the empyema space. The attainment of these objectives may in turn make possible, or require excision of the damaged lung tissue, or surgical collapse measures when excision is not feasible.

The sequence in which these objectives are approached must be varied to meet the existing situation. If the empyema is acute and is associated with an exudative parenchymal lesion in a febrile toxic patient, the defense mechanisms must be marshaled in an orderly and precise manner. Our practice is to place the patient on one of the several satisfactory chemotherapy regimens immediately and to do closed thoracotomy. A No. 20 French or larger rubber catheter is inserted in an appropriate interspace and suction equivalent to a negative pressure of 10 to 15 cm. of water applied. It has been our experience that such an amount of suction improves drainage and frequently encourages re-expansion without reopening a bronchopleural fistula. Needle aspiration is not done after the first diagnostic puncture because of the tendency to develop needle tract abscesses.

Drug treatment must be continued for an indefinite period, at least one year and commonly two years. After two months of treatment, or earlier if conditions warrant, a reappraisal is made. If the course is to be benign, obliteration of the empyema space will have been accomplished by re-expansion of the lung and elimination of the exudate. Treatment with drugs can then be continued and necessary surgical measures introduced at a suitable time as in any case of parenchymal disease without empyema.

If, however, the space does not obliterate after six-to-eight weeks of treatment, more active measures are demanded. In such patients, particularly if the disease is confined to one lung, surgical intervention is required at a much earlier time than in patients under drug therapy for acute parenchymal disease. If the objective of removal of toxicity is to be satisfied, this empyema space must be obliterated. It is our practice under such conditions to do an extensive thoracoplasty before proceeding
to resection. Occasionally by doing a prior thoracoplasty the need for resection may be removed. If resection proves necessary it can then be done on a patient in better condition and with less postoperative disturbance than if resection is done at the height of the inflammatory process.

A more chronic type of empyema is sometimes encountered. This is one in which the empyema represents a complication of some type of treatment, often, in former years, pneumothorax or pneumonolysis done in the attempt to improve the collapse. Under such circumstances there is more time available to plan the treatment course and to marshal the patient's reserves. The empyema has not developed in virgin soil since a defensive barrier of fibrosis had already been erected as a result of the treatment program. Chemotherapy is initiated or continued as the situation demands. Deficiencies in blood volume are corrected and electrolyte supplied if necessary. Avitaminosis is remedied. If the parenchymal lesion is stable and resection not necessary, the sputum negative by culture, and bronchopleural fistula is not present, it is usually possible to proceed with decortication depending upon rapid re-expansion of the lung to eliminate the empyema pocket.

There remains, however, a third group of patients who fall midway between the acutely ill and the chronic type. They have a considerable amount of parenchymal disease, frequently bilateral in distribution and unstable in character. A cavity may be present and bronchopleural fistula is present or has been demonstrated at some time during the course of the empyema. These patients are chronically ill, have a depletion of their blood volume, an electrolyte imbalance and frequently amyloidosis. Fortunately, with the modern drug treatment of tuberculosis, they are being encountered with decreasing frequency. Each step of the treatment program must be carefully planned. The blood volume and depleted protein reserves are restored by means of blood transfusions. Vitamin deficiencies and electrolyte imbalances are corrected. At the initial thoracentesis we insert a Pezzer catheter and attach a suction pump set at 10 to 15 cc. of water negative pressure. We commonly use varidase or tryptase instillations after drainage is established, not with much hope of eliminating the thickened membrane but with the objective of cleaning up the empyema pocket prior to the necessary reparative surgery.

Opinions differ as to the best corrective measure to apply in such circumstances. Many surgeons proceed with thoracoplasty or with extrapleural pneumonectomy without preliminary drainage. In our minds the preliminary drainage serves not only to clean up the area prior to surgery but minimizes the possibility of spread of the purulent material to the contralateral lung while under general anesthesia.

Having initiated drainage and placed the patient in better clinical condition, we must not delay too long before instituting reparative measures. It is more dramatic to remove the pleural sac and the involved area of lung at the initial operation. In our hands, however, the complications following such procedures have been higher than in patients upon whom we did one or two stages of thoracoplasty followed by decor-
tication and resection of the lung or lobe as necessary. If the chest wall is collapsed prior to excision, the secondary infection which commonly develops is not nearly as difficult to handle as it is when the parietal pleura has been decorticated and the chest wall otherwise left intact. It is frequently necessary to do several subsequent modified Schede type of procedures unroofing and saucerizing sinus tracts before final success is attained.

DISCUSSION AND SUMMARY

In 1931 a Committee Report on the Treatment of Tuberculous Empyema was submitted by Leroy S. Peters, Paul Ringer, J. J. Singer, and E. S. Welles. Among other conclusions were these:

1. Most tuberculous empyemata are best treated by no treatment.
2. Aspiration is justified to relieve high fever and pressure symptoms.
3. Closed or open drainage is not warranted since it converts a simple empyema into a pyogenic one.

In the years following that report and before the advent of successful chemotherapy, considerable reduction in mortality had been brought about by the more frequent use of thoracoplasty with or without preliminary drainage.

The demonstration of the bacteriostatic effect of streptomycin in 1946 opened the door for further improvements in the management of tuberculous empyema.

Active treatment has replaced inactivity. As soon as a diagnosis is established a carefully formulated program is set in motion with the objectives of elimination of toxicity, stabilization of the disease process and obliteration of the empyema space. These goals may occasionally be accomplished with chemotherapy and thoracentesis. Most commonly, however, chemotherapy accompanied by drainage, decortication, thoracoplasty, or resection is required.

DISCUSSION Y RESUMEN

En 1931 se presentó un informe de un comité para el estudio del Tratamiento de Empiema Tuberculoso, por Leroy S. Peters, Paul-Ringer, J. J. Singer y E. S. Welles.

Entre otras conclusiones se encontraban las siguientes:

1. La mayoría de los empiemas se tratan mejor por la abstención.
2. La aspiración se justifica para aliviar la temperatura elevada y los síntomas de compresión.
3. La canalización abierta o cerrada no están justificadas puesto que convierten un empiema simple en un piogénico.

En los años siguientes a este informe y antes del advenimiento de la quimioterapia satisfactoria, se presenció una considerable reducción de la mortalidad por el uso más frecuente de la toracoplastia con o sin canalización preliminar.

La demostración del poder bacteriostático de la estreptomicina en 1946 abrió la puerta para mayores mejoras en el tratamiento del empiema tuberculoso.
El tratamiento activo ha substituido al expectante. Tan pronto como el diagnóstico se establece se pone en práctica un plan cuidadoso para eliminar la toxicidad, para estabilizar el proceso patológico y la obliteración del espacio empiemático. Estos objetivos pueden ocasionalmente alcanzarse con la quimioterapia y la toracentesis. Más a menudo sin embargo, se requieren la quimioterapia acompañada de canalización, decorticación, toracoplastía o resección.

DISCUSSION ET RESUME

En 1931, un rapport sur le traitement de la pleurésie purulente tuberculeuse fut présenté par Leroy S. Peters, Paul Ringers, J. J. Singer et E. S. Welles.

Parmi d'autres conclusions, on peut relever celles-ci:

1. Pour la plupart des épanchements tuberculeux, le meilleur traitement est de n'en faire aucun.
2. L'aspiration est justifiée pour soulager la fièvre et les symptômes de compression.
3. Le drainage, ouvert ou fermé, n'est pas recommandé puisqu'il transforme un épanchement simple en épanchement purulent.

Dans les années suivant cette communication, et avant l'apparition de la chimiothérapie bienfaîtrice, on a obtenu une réduction considérable de la mortalité par l'usage fréquent de la thoracoplastie avec ou sans drainage préalable.

La démonstration de l'effet bactériostatique de la streptomycine en 1946 ouvrit la voie à des améliorations ultérieures dans le traitement de l'épanchement tuberculeux.

Un traitement actif a remplacé l'absence de traitement. Dès qu'un diagnostic est établi, un programme soigneusement élaboré est mis en œuvre pour éliminer la toxicité, stabiliser le processus de la maladie et compléter l'espace occupé par l'épanchement. Ces desseins peuvent être atteints dans certains cas par la chimiothérapie et la thoracenthèse. Plus souvent cependant, il faut associer la chimiothérapie au drainage, à la décortication, à la thoracoplastie ou à la résection.

BESPRECHUNG & ZUSAMMENFASSUNG

Im Jahre 1931 wurde ein Ausschussbericht über die Behandlung des tuberkulösen Empyems vorgelegt von Leroy S. Peters, Paul Ringer, J. J. Singer und E. S. Welles. Unter anderem ergaben sich daraus die folgenden Schlüsse:

1. Die meisten tuberkulösen Empyeme werden am besten behandelt, wenn sie nicht behandelt werden.
2. Eine Punktion ist gerechtfertigt, um hohes Fieber und Druckerscheinungen zu beheben.
3. Geschlossene oder offene Drainage ist nicht vertretbar, weil sie aus einem einfachen Empyem ein eitriges macht.

In den auf diesen Bericht folgenden Jahren und vor dem Eintritt er-
folgreicher Chemo-Therapie wurde eine beträchtliche Verminderung der Mortalität erzielt mit Hilfe des häufigeren Gebrauches der Thorakoplastik mit oder ohne einleitende Drainage.

Der Nachweis der bakterioostatischen Wirkung des Streptomycins im Jahre 1946 eröffnete die Voraussetzungen für eine weitere Verbesserung in der Behandlung des tuberkulösen Empyems.


REFERENCES