





# A STUDY OF SEVENTEEN CASES OF EMPYEMA.

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INASMUCH as the rational therapy of empyema belongs to the realm of surgery, empyema may be regarded as essentially a surgical disease. It is not the intent of this paper to discuss the pathology, the symptomatology or the treatment of the disease, but to present a series of cases, and deduce from them whatever lessons they may teach.

These cases occurred in the services of Drs. Pilcher and Fowler, in the Methodist Episcopal Hospital, in Brooklyn. The very brief histories herewith given are abstracted from the more elaborate histories in the archives of the hospital. The common symptoms of empyema presented by the cases, either before or after the operation, are not given unless they have some special feature. In all cases, the operations were conducted as aseptically as though a fresh wound were to be made in normal tissue. The operators were not influenced by the mistaken idea that "pus is pus," but took the precautions which modern surgery has at command to prevent the nocuous infection of innocuous pus. In the cases subjected to operation, it was the custom to strip of its periosteum and vessels the portion of rib to be resected and remove only the bone. In order to prevent the danger of collapse in feeble patients, the rapidity of the escape of pus was lessened by introducing the finger into the wound, or by placing some obstruction at the surface. Drainage tubes were introduced in all cases. Usually two fenestrated rubber tubes were used. Irrigation of the cavity with warm aseptic or antiseptic solution was practiced. For this purpose boro-salicylic, hydro-naphthol, normal salt solution or distilled water was employed. None but sterilized dressings were used. After the operation, as the lung expanded, and the amount of discharge became less, the tubes



were shortened from time to time, and were usually discarded about the fourth week. The frequency of dressing was governed by the amount of discharge. During the first week it was usually necessary to change the dressings every day. Irrigation was practiced at the dressings when the discharge was septic in character. The cases were placed on tonic treatment, and the pain and cough of irritation were combatted with appropriate remedies. These features, common to all of the cases, are omitted from the brief histories below, unless they present some peculiarity.

CASE I.—Female, forty-two years. Six weeks prior to admission to the hospital the patient developed an idiopathic pleurisy of the left chest. The active symptoms subsided, but she continued to lose flesh and strength, and was admitted in a much reduced condition. Physical examination showed fluid filling the lower half of the left pleural sac. Pus was obtained by introducing a needle in the eighth space in the mammary line. On the third day after admission she began to expectorate large quantities of purulent matter, and presented the physical signs of rupture of pleural pus into the lung.

*Operation.*—Three inch incision over sixth rib. One and one-half inches of rib excised in axillary line. Pleura opened and a large amount of greenish pus evacuated. At the same time a considerable quantity of purulent fluid escaped from the mouth.

During the four weeks subsequent to the operation the discharge from the wound, which for the first few days was profuse, gradually became less. The wound was irrigated daily through the tube. The lung expanded well. The expectoration, which immediately after the operation was composed of bloody pus, entirely subsided. Aside from a slight, irritable cough, and occasional pain at the site of the wound, the patient was well when she was dismissed, two months after admission.

Before the operation the temperature fluctuated between  $99^{\circ}$  and  $102.5^{\circ}$ . The pulse rate had gradually increased up to 135. Respiration was 30-35. After the operation the temperature fell to normal. For twenty-four days the evening temperature continued to rise slightly above normal. It then subsided. The pulse rate gradually sank to normal. Respiration remained at 38 for three days subsequent to the operation, and then steadily decreased.

CASE II.—Male, eleven years. A delicate child. Acute symptoms three years before admission. Symptoms of pleuritis with

effusion were followed by symptoms of empyema of the right chest, with perforation into the lung. For two years the patient had been coughing up large quantities of pus. His general condition became much worse. A fluctuating tumor finally appeared directly under the right nipple, which increased in size until it reached three inches in diameter.

*Operation.*—The tumor was incised and pus and necrotic debris were evacuated. No opening into the pleural cavity was discovered. A section of bone was removed from the subjacent rib.

The pleura was found greatly thickened. There was so little evidence of fluid within the pleural cavity that the pleura was not opened.

After the operation, during the attacks of coughing, air passed in and out through the wound. A considerable discharge of pus persisted.

Aspirating needle introduced in sixth space discovered no pus. Pus obtained in seventh space in the axillary line. Section of seventh rib excised. Pleura opened and considerable pus liberated. The pleura was very dense and thick. For ten days following the operation there was a copious discharge. The patient's general condition improved very much after the second operation. Both wounds healed firmly.

After the first operation the temperature, pulse and respiration rates continued above normal; after the second operation they gradually subsided.

At the present time, three and one-half years after the operation, the patient enjoys good health, and has no symptoms referable to the chest. He has a right concave scoliosis of so marked a degree as to produce a very noticeable deformity. The right chest in its lower part is bound down and contracted, and the left chest has undergone compensatory enlargement. The scoliosis is most marked in the upper dorsal segment.

CASE III.—Male, eight years. Empyema of left chest subsequent to pneumonia two years before admission to hospital. Tumor appeared below nipple, was incised and pus evacuated. At the time of admission, eighteen months later, this was still a discharging sinus. Patient was much emaciated.

*Operation.*—Incision in axillary line exposing fourth, fifth, sixth and seventh ribs. One and one-half inches of each rib resected. Pleura opened at site of sixth rib. A large amount of foul-smelling pus evacuated.

An abundant discharge of pus continued after the operation, necessitating frequent dressings. After the fourth day irrigation of the cavity with tincture iodii 1 : 250 was begun. The amount of discharge steadily decreased, the lung expanded, and the cavity contracted and closed. The patient's general condition was much improved. He became robust and felt perfectly well.

After operation the temperature sank to subnormal, and then gradually ascended.

CASE IV.—Male, twenty-one years. An advanced case of phthisis admitted to the surgical service from the medical service with the diagnosis of pyopneumothorax following the rupture of a tuberculous cavity through the pleura. The pus dullness had steadily increased till it occupied the lower half of the left pleural cavity. The lung lesion was very pronounced and the patient was *in extremis*. Respiration 30 to 40; chloroform was administered, and at the time when surgical anæsthesia was reached respiration ceased, and heart failure followed in a few seconds. Faradism and artificial respiration were of no avail. The autopsy showed a large amount of pus in the pleural cavity and extensive tuberculous destruction of the lungs.

CASE V.—Female, forty-four years. In childhood patient suffered with tubercular coxitis and spondylitis, resulting in a marked kyphosis. Nine months before admission she developed pleurisy on the right side, with effusion, following pneumonia. This soon became an empyema, and patient became greatly prostrated. Aspiration showed pus.

*Operation.*—Incision in axillary line parallel over eighth rib. Two inches of rib removed. Exploring needle found pus, and the incision was continued through the pleura. About one pint of thin pus escaped. Irrigated with normal salt solution.

The discharge, which at first was profuse and offensive, gradually became less, and the patient's general condition steadily improved. Three weeks after the operation the discharge had practically ceased, and the patient was dismissed.

Before the operation the temperature ran along at 99°. After the operation it steadily rose, reaching its maximum, 101°, on the third day. From this it subsided to normal.

At the present time, thirteen months after operation, the patient is well and strong, and has no chest symptoms, excepting an occasional pain on the affected side.

CASE VI.—Male, sixty-three years. Patient was operated upon

for papilloma of the bladder, and while still in the hospital developed double idiopathic pleurisy with effusion. Resolution took place on the right side, but the left became an empyema. Sixty-eight ounces of thin pus were drawn off with the aspirator. Five days later a resection of two inches of the eighth and ninth ribs was done, and a considerable amount of pus liberated. Seven weeks after the operation the wound was perfectly dry. The temperature sank after the aspiration and after the rib resection. On account of wounds elsewhere, its curves can not be attributed alone to the empyema.

The above cases occurred in the service of Dr. Fowler; the following are from the service of Dr. Pilcher.

CASE VII.—Male, thirty-two years. This case was brought to the hospital *in extremis*. Physical examination showed fluid in the left pleural cavity, and advanced tubercular disease in both lungs. His condition was so low that operation was not deemed advisable. The left pleural cavity was aspirated, and four ounces of pus drawn off. The patient continued to sink, and in the course of twenty-four hours died.

CASE VIII.—Female, ten years. Patient was admitted with double empyema of idiopathic origin. Pulse rapid and feeble; breathing rapid and insufficient; face cyanotic.

*Operation.*—Two inches of eighth right rib removed at the angle. Pleura opened, and a large amount of pus containing cheesy, inspissated matter was liberated.

The operation was followed by marked prostration.

Seven days later, when the patient had rallied, a second operation was done on the left side. Two inches of eighth rib were excised at the angle. Eight ounces of pus and cheesy material were liberated from the pleural cavity. Irrigated with distilled water.

After each of the operations the patients suffered much pain and exacerbations of coughing. Her general condition was better after the second than after the first operation. The pleuræ were irrigated daily. Tubes were removed on the seventeenth day after the respective operations. Convalescence was rapid. Eight weeks after admission both wounds were solidly healed.

After the operations, the temperature and pulse rate were lowered, but continued up to the time of her discharge slightly above normal. The respiration rate, which after the first operation was 70–80, gradually decreased to 30.

At the present time, eighteen months after her discharge from the hospital, the patient is a robust, healthy child. At the seat of the right cicatrix is a depression slightly more than 1 cm. deep. The respiratory murmur over the scar is normal. Below the seat of operation the pulmonary resonance is dull, and the breathing sounds are very faint. On the left side the resonance below the scar is slightly dull; respiratory murmur normal. There are no symptoms referable to the chest, excepting an occasional slight irritable cough. She takes a full breath without producing pain or râles. A slight tendency to habitual dorso-lumbar kyphosis has developed since the operation.

CASE IX.—Female, five years. After a pneumonia, three months before admission to the hospital, a pleural effusion developed in the left chest, which was continuous with the subsequent objective and subjective symptoms of empyema. On admission there was a very perceptible bulging of the intercostal spaces on the left side. Pus was discovered with the aspirating needle in the eighth interspace.

*Operation.*—One and one-half inches of ninth rib removed just posterior to posterior axillary line. Thick, yellow pus liberated from pleural cavity. Three large drainage tubes introduced. The lung gradually expanded, and the case went on to complete closure of the sinus.

After the operation the temperature and pulse rate diminished. The respiration rate increased slightly—from 35 to 37-40.

At the present time, seventeen months after the operation, the patient has no symptoms referable to the thorax, excepting an occasional neuralgic-like pain following exposure to cold. There has developed since the operation a slight right convex dorsal scoliosis. The respiratory murmur and pulmonary resonance over the seat of operation are normal.

CASE X.—Male, forty-four years. This patient had previously been a healthy man. Three months prior to admission to hospital, among other symptoms, he developed violent epigastric pain and vomiting. He was unable to swallow solid food. Four weeks later pain developed in the lower part of the right chest, which he interpreted as pleurisy; and in the course of three weeks more he began to experience more pain about the free border of the ribs. He became much prostrated.

At the time of his admission to the hospital he presented the symptoms of an empyema of the right chest, extending up to the



fourth rib. The aspirating needle introduced in the seventh space discovered pus.

*Operation.*—One and one-half inches of the rib, just anterior to angle, removed. Two quarts of greenish, foul-smelling pus, containing necrotic debris and jelly-like material, evacuated. While the fluid was escaping from the wound the patient collapsed, and required vigorous stimulation. The diaphragm was found perforated, and a large abscess cavity in the liver. Active stimulation was continued, but patient steadily sank and died in fourteen hours.

CASE XI.—Female, twenty-four years. History of pneumonia ten years before admission to hospital. Five weeks prior to admission the symptoms which terminated in empyema began. At the end of four weeks an opening spontaneously occurred in the left chest wall in the sixth interspace in the nipple line, and discharged some pus. On admission a considerable current of air passed in and out through this opening with the respiratory movements. The patient was feeble and emaciated, Delirious at times. Feet and legs œdematous. Bed sore on left hip. Physical examination discovered signs of bronchial fistula.

*Operation.*—Cocaine M 30, 4 per cent. solution. One inch of ninth rib resected. Pleura opened and pus liberated. Not irrigated. On the following day the patient's condition was very low. The discharge from the wound was profuse. On the third day after the operation she died. Autopsy showed miliary tuberculosis. Nearly the whole of left lung was involved, and the right was completely consolidated.

CASE XII.—Female, thirteen years. Two years prior to admission to hospital an abscess of empyemic origin spontaneously ruptured in the right lumbar region. The sinus continued to discharge.

*Operation.*—One inch of tenth rib excised just anterior to angle. Pus discovered in pleural cavity. Old sinus curretted. Tubes introduced through both openings. Subsequent treatment with hydrogen peroxide and iodoform emulsion resulted in a complete cessation of the discharge and a closing of the sinuses. At the end of six weeks the patient was discharged cured.

At the time of operation the temperature was normal. After the operation it arose to 100° F. and then gradually subsided.

Until a week ago, which was seven months after the operation, the patient had been well and strong. She had steadily improved

since leaving the hospital, and the wounds remained solidly closed. One week ago the original sinus spontaneously reopened and a small amount of pus escaped.

CASE XIII.—Female, twenty-five years. Six months prior to admission to hospital patient developed a septic condition following child-birth. This was in turn followed by purulent pleuritis. Three months later a tumor appeared in the right sixth intercostal space, a little external to the nipple line. This was incised, and a sinus persisted.

*Operation.*—Sinus curetted. Section of ninth rib removed in axillary line. Large quantity of foul, thick pus escaped. Irrigated, and scraped with a blunt spoon.

Two weeks after operation patient was absent from hospital for several days. Soon after this the wound closed and the febrile evidences of retention appeared. The wound was reopened and a considerable amount of retained pus was liberated. Under treatment with hydrogen peroxide and 10 per cent. iodoform emulsion, the secretion diminished. At the end of three months the patient was dismissed from the hospital with her general condition very greatly improved, but with a small and gradually closing abscess cavity.

Before operation the temperature ranged from normal, to  $101^{\circ}$ ; pulse, 120–160; respiration, 25–30. At the time of her discharge from the hospital the temperature and pulse rate were normal and respiration was 20–25.

Since her discharge the sinus has closed on three occasions, and been reopened. A bronchial fistula was present, as evidenced by the fact that medication introduced into the wound was coughed up and spat out. At the present time the wound has been solidly closed for five weeks.

CASE XIV.—Female, thirty years. A bullet from a pistol entered the patient's back, piercing the left sixth rib two and one-half inches from the spine, and lodged under the skin at the upper side of the left breast. Four weeks after the injury the expectoration, which had previously been bloody, began to show traces of pus, and the patient presented the symptoms of empyema. One week later one and one-half inches of the ninth rib in the posterior axillary line were excised. A large amount of foul-smelling, bloody pus was evacuated from the pleural cavity. The finger introduced discovered free spicules of bone lying in the bottom of the pleural sac. The foreign matter was removed and two large drainage tubes inserted. The after-treatment

of the wound was the same as in the other cases of empyema. Later on, hydrogen peroxide and iodoform emulsion were employed, and ultimate sound healing of the wounds was secured.

Before the operation the temperature was irregular, ranging from normal to  $103.6^{\circ}$ . At the time of operation it had been steadily going down, and had reached normal. After the operation it gradually arose, reaching its maximum,  $104.2^{\circ}$ , on the tenth day. From this it steadily declined to normal.

CASE XV.—Male, nine years. Acute idiopathic pleuritis, four weeks before admission, resulted in empyema of the right chest. The patient became greatly emaciated and prostrated.

*Operation.*—One and one-half inches of ninth rib removed in the posterior axillary line. A large amount of pus and thick, flocculent material evacuated. The lung was found retracted beyond the reach of the index finger. The tube was removed on the tenth day. The lung expanded well. The general condition of the patient rapidly improved, and at the end of five weeks the wound was perfectly healed and dry.

After the operation the temperature, respiration and pulse rates steadily diminished.

CASE XVI.—Male, thirty-seven years. Admitted greatly prostrated with advanced chronic phthisis, and empyema due to rupture of a tuberculous cavity into the left pleural sac. The resection of a portion of rib was done in the axillary line. Pus and necrotic debris were evacuated. The patient continued to sink, and survived the operation but four days.

CASE XVII.—Male, twenty years. Acute symptoms began three weeks previous to admission to hospital, when patient developed a pneumonic process in the left lung, with gangrene of pulmonary tissue. He coughed up fetid matter and presented the physical signs of cavity in the lung. Admitted to hospital with pyopneumothorax. One inch of ninth rib resected and a large amount of stinking pus liberated. At the end of a week he was greatly improved. On the tenth day the symptoms of pneumonia in the previously sound lung developed, which terminated fatally at the end of six days. Autopsy showed large cavity in left lung and pneumonic consolidation in lower lobe of right.

After the operation the temperature declined gradually from  $103^{\circ}$  to normal, and then as the complication in the other lung developed, it rapidly rose until the end.

Of these seventeen cases six were of idiopathic origin; four followed pneumonia; four were preceded by pulmonary tuberculosis; one was associated with puerperal septicæmia; one followed the rupture of an abscess of the liver through the diaphragm; and one was traumatic in origin. In one of the idiopathic cases both sides were involved.

The four cases, IV, VII, XI and XVI, which were complicated with tuberculosis, all terminated fatally. Case IV, in which a tuberculous cavity in the lung had ruptured through the pleura, and given rise to pyopneumothorax, died during the anæsthetization. Case XVI, of the same character, survived the operation four days. Case XI, in which had spontaneously developed a sinus through the chest wall, and a bronchial fistula, died on the third day after the operation. And Case VII expired within twenty-four hours after admission, four ounces of pus having been aspirated from the chest. These four cases presented advanced tubercular disease of both lungs. Of the two remaining fatal cases, X and XVII, the first, which had for its ætiology the rupture of a liver abscess into the pleural sac, died a few hours after the operation for empyema; and the second perished from a complicating pneumonia in the previously sound lung.

The ages of the cases of idiopathic origin were respectively nine, ten, eleven, thirteen, forty-two and sixty-three. Those following pneumonia were five, eight, twenty and forty-four. The cases associated with pulmonary tuberculosis were twenty-one, twenty-four, thirty-two and thirty-seven.

Of the cases of single empyema not traumatic in origin six involved the left side, and nine involved the right side.

Spontaneous evacuation occurred in four cases into the lung; in one case through the chest wall; and in one in the lumbar region. Three more cases presented a single, thin-walled, fluctuating tumor of the chest, which, in the course of time, would have spontaneously ruptured.

In Cases I, II, VI, VIII, IX, XIII and XV the temperature gradually subsided after the operation. In Case V, in which the pus was foul smelling, the temperature, which at the time of operation was  $99^{\circ}$ , gradually rose for three days after the oper-

ation, and then subsided. Case XIV, from which foul-smelling pus was evacuated, had a normal temperature at the time of operation, which, after the evacuation of the pus, steadily rose to  $104.2^{\circ}$ , and then subsided to normal. The temperature in Case XII, which previous to the operation was normal, gradually rose after the operation and then subsided.

In the majority of cases the respiration rate decreased after the operation. In Cases I and IX it increased for several days after the evacuation of the pus, and then diminished.

Of the fifteen cases subjected to operation it is now known that nine are cured; one, which cannot be communicated with, is probably cured; and one, though greatly improved, has recently had a recurrence of the discharge from the old sinus. Six cases died: four with operation, and two without operation.

Habitual spinal curvatures, of a greater or lesser degree, have been observed in the cases of the younger patients.

What may we conclude from a study of these foregoing cases? It is to be regretted that the fluids were not subjected to bacteriological examination. Inasmuch as this is the case, an opinion as to their ætiology has little scientific value. This is especially true of the so-called idiopathic cases. In all probability the tubercular cases, IV, XI and XVI, in one of which was a sinus through the chest wall, and a bronchial fistula, and in the other two, perforated tuberculous cavities, contained, besides the tubercle bacillus, the pyogenic staphylococci and streptococci. These two last cases cannot be regarded as tubercular pleurisy at all, but as a violent septic pleuritis, due to infection from an abscess cavity, with its numerous varieties of pyogenic micro-organisms.

The four tubercular cases tend to corroborate the lesson which many surgeons urge, that pulmonary tuberculosis, complicating an empyema, constitutes a contra-indication to operative interference. In all of these cases, the empyema developed only when the tuberculous destruction of pulmonary tissue had reached a very advanced stage. The patients were already affected by a disease which, had the empyema not occurred, would, in itself, almost certainly have led to a fatal issue.

Whether the cases following pneumonia had for their ætiological factor the pneumococcus must always remain a question.

The ætiology of Case X has some obscure points ; and the question may be ventured as to which was the primary lesion—the empyema or the abscess of the liver ? The pain, which the patient referred to the free border of the ribs over the liver, was possibly due to an adhesive peritonitis between the upper surface of the liver and the diaphragm, followed by the perforation. The fact that this pain was preceded by the subjective symptoms of pleurisy might point to a lesion primarily of the pleura. On the other hand the pronounced gastric symptoms which marked the onset of the trouble, with the pain about the liver, and the œsophageal stenosis, speak more for the primary lesion of that organ ; and it is most probable that the pain, which was subjectively interpreted as pleuritis, was a diaphragmatic peritonitis, which preceded the perforation of a liver abscess into the pleural cavity.

Although spontaneous evacuation occurred in six of the seventeen cases, leaving out of account those caused by perforation of tuberculous cavities into the pleura, the opening was external in only two ; and neither of these was in the most favorable location. From the experience with these cases, it may be deduced that it is unwise and dangerous to allow an empyema to pursue its natural course with the hope of a spontaneous cure being effected, when an operation, which, in itself, is attended with far less danger than the natural course of the disease, can be performed.

Why certain cases, from some of which foul-smelling and evidently septic pus was evacuated, developed higher temperatures after the evacuation of the pus than they had presented before the operation, can be accounted for in one or more of the following ways : The low temperature before the operation may have been because, (1) the pus was contained in a cavity inclosed by a thickened wall, covered with fibrinous deposit, rendering its surface incapable of readily absorbing septic material ; (2) the tension upon the walls of the pus cavity so impeded the blood and lymphatic circulation that absorption was, to a greater or lesser degree, hindered ; (3) the patient may have gradually become immune to the action of the ptomaines, which for a long time were constantly being absorbed in small quantities ; (4) the pus may not have

been a septic pus. The subsequent rise of temperature may have been due to the fact that (1) the operation wound and the breaking up of adhesions within the pleural cavity opened chinks and channels for the admission into the connective tissue spaces of the thorax of septic material which had been previously enclosed by non-absorbing surfaces; (2) infection from without may have occurred at the time of operation; (3) the febrile movement may have been simply the fever of irritation so often observed after operation or injury; (4) it may have been due to constitutional causes other than the empyema.

The fact that the younger patients show so marked a tendency after operation to habitual spinal curvatures, demands more than a passing notice. There is in these cases the inevitable tendency to flex the dorsal vertebræ toward the diseased side. It arises from the greater comfort which is gained by the position, and the natural tendency of the chest, emptied of a part of its contents, to collapse. The patient finds that this position immobilizes, to a certain degree, the tissues about the wound, and diminishes the painful friction of the opposed pleural surfaces. This, in connection with the collapse of the diseased chest, and the compensatory emphysema of the sound lung, tends to throw the spinal column in lateral flexion toward the affected side. Anatomically the deformity is not so much due to muscular atrophy as to the intra-thoracic adhesions and the ligamentous and fibrous changes in the walls of the thorax, which occur in parts fixed for a considerable period of time in one position. The muscular degeneration is secondary to these changes. It therefore commends itself, that an effort be made soon after the operation to prevent this sequel. Let the spinal column be immobilized by some mechanical means, as a light plaster-of-Paris jacket; and, either immediately or as the diseased lung expands, let the tendency to deformity be gradually corrected, until finally the convexity of an artificial scoliosis is made to look toward the diseased side. The spine may be retained in this over-corrected position until the lung has fully expanded, and the danger of an habitual spinal curvature is passed. When the wound has become permanently healed, such gymnastic exercises and massage as shall develop the diseased chest should be inaugurated.











