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THE

TREATMENT OF EMPYEMA.

BY BAYARD HOLMES, D. SC., M. D.

Professor of Surgery in the Post-Graduate Medical School of Chicago; Surgeon to the South Side Dispensary and to the Post-Graduate Hospital; Attending Physician to the Cook County Hospital.

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411
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THE TREATMENT OF EMPYEMA.

It will be observed from a study of the following cases that there remains much to be desired in the way of treatment of pyothorax, and that all indications point to the early operation. A very much larger number of cases have been observed during the past year than ever before in the same length of time. The influenza is justly referred to as the forerunner of a number of the cases reported. In order to come to some conclusions in regard to the proper indications for operating, it may be well to consider the etiology of empyema from the standpoint of modern pathology.

There can certainly be no progressive suppuration without the presence of pyogenic bacteria. Every other form of inflammation in the pleural cavity is due to the infection of that cavity with non-pyogenic but pathogenic bacteria or other micro-organisms. [1] It follows from the anatomy of the pleura that, except in penetrating wounds, its infection must always be secondary, and pleuritis and empyema must be looked upon as secondary and complicating diseases.[2]

The normal physiological resistance of the peritoneum to infection is known from clinical experience and experiment to be very great. (*Rinne.*) This, as I have repeatedly asserted, is due to the evolution of a tolerance to infection from the great proximity of infective material in the intestinal canal. The same tolerance to infection has not been evolved in the pleural surfaces, for they are farther removed from sources of contamination.[3]

[1] Pentzold looks upon empyema as a frequent sequela of fibrinous pneumonia. He considers the empyema in these cases due to secondary infection with pus microbes. Rib resection gives the best results in this author's hands.

[2] Vinay describes a case of pneumothorax which originated in a healthy man on his arising from bed. It healed without any trouble or effusion, or loss of function in about two months. This shows how perfect the filtering power of the bronchioles is, and how necessary an infection is to the formation of an effusion.

[3] From the investigations of Kracht it would appear that micro-organisms are absent in simple serous effusions. Those found in purulent or fibrino-purulent pleuritis are not specific for the empyema, but point to a whole series of concomitant inflammations. Empyema only appears when the pleura is so injured or its cavity contains such a fluid that a suitable soil is present for the multiplication of pus cocci. Kracht experimented upon rabbits with a view of demonstrating the origin of empyema. He injected pus bacteria into the pleural cavity, and saw no injury result, but, when mixed with a large quantity of water or ptomaines pleuritis resulted.

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The pleuræ are most likely to be infected from the invasion of micro-organisms from infected air cells or bronchioles. These small air spaces are almost as impervious to germs as the wad of cotton with which we stop our test-tubes. So the pleuræ are much less liable than the peritoneum to infection, and, therefore, natural selection has not guaranteed us the same germicidal power in the pleural surfaces which we find in the peritoneum. The pericardium is still farther removed from the possibility of infection, and is, therefore, still less tolerant when infected.

One of the causes which determines the localization of infection anywhere is an antecedent infection and coincident saturation of the germicidal power of the part and of the blood nourishing it. This is almost a prime essential to the infection of the pleuræ with pyogenic bacteria. [4] Suppurative disease of the pleura rarely takes place without a previous general septicæmia with some such parasite as the pneumococcus, the malaria plasmodium, or the parasite of influenza (*Klebs*), [5] or one of the other infective diseases. This

In five cases of serous exudation (human) he demonstrated the presence of staphylococcus aureus, or in mixed cultures with staphylococcus albus and citreus.

[4] Weichselbaum found the streptococcus pyogenes alone in two cases of empyema. In one other case of sero-fibrinous effusion it was associated with the staphylococcus pyogenes.

[5] Professor Klebs of Zurich, gives the results of his examination of the blood in cases of influenza. He finds a large number of highly refractile, mobile bodies, in size, form, and motility resembling bodies which he has met with in pernicious anæmia, but in far less quantity. Moreover, no microcytes, such as occur in the latter disease, were to be seen. In a fatal case of influenza some blood was removed from the heart, with every precaution to avoid contamination, and the "monads" were detected therein, they varied somewhat in size, being oval in shape, and not only had vibratory movement, but were also capable of locomotion. They were often attached to the margin or imbedded in the substance of the blood corpuscles. The organisms were distinctly flagellated, and in stained preparations their intimate connection with the corpuscles could be plainly shown. Provisionally, Klebs would assign them a place among the Rhizomastigma of the Monadineæ, according to Bütschli's classification of these protozoal forms. The professor remarks that in other diseases in which similar hæmatozoa have been discovered, as ague and pernicious anæmia, there is a tendency to intermittency in the type of fever; and since influenza shows a like tendency—commonly styled relapse—he thinks it quite possible that each relapse is associated with stages in the development of the micro-organism. Some authors still speak of idiopathic pleuritis, probably meaning those in which no source of infection can be discovered. This term, as well as primary pleuritis, should be abandoned, because it favors a lax etiological diagnosis. Ziegler looks upon pleuritis as secondary in most cases, and from time to time the number of these primary pleurisies are diminished by more careful investigations. The diagnosis of primary pleuritis is only an excuse for etiological ignorance.

coincident septicæmia and consequent saturation of the germicidal power of the blood account for a diminished physiological resistance, always small in the pleura as we have already seen. It is still necessary to account for the presence of the pyogenic bacteria. Because this subject has not been adequately studied experimentally, it is possible only to conjecture the source of infection from analogous cases. In many cases of pleuritis there is an extensive or limited pneumonia. In this pneumonic area, as time goes on, the bronchioles become infected to a greater or less depth, with the pyogenic bacteria which are always present in the air we breathe, and therefore in the larger bronchi. The œdema surrounding the bronchioles in the pneumonic area blocks the normal course of the lymphatics toward the hylus of the lung, and the current from active congestion turns in the direction of the periphery of the lung and the pleural cavity. For a time the effused fluid is germ-free and is absorbed by the still healthy pleura over the unaffected portion of the lung and the parietes. In a series of experiments upon rabbits, undertaken by Fleiner, it is shown that fluids (blood and fluids holding coloring matter in suspension) injected into the pleural cavities are readily absorbed, and that the corpuscular elements or color granules are easily recognized in the mediastinal lymph glands. It seems that normal respiratory movements are necessary for this transfer of matter. This absorption, however, reaches a limit when the effused serum carries with it also so large a quantity of infectious germs that corresponding pathological changes take place in the absorbing pleura. Its epithelium becomes swollen, and multiplies imperfectly. Its normal physiological action is suspended; the whole pleural surface becomes the seat of suppuration. A true empyema supervenes. It is not to be supposed that under conditions of health the pleura is unable to resist a moderate amount of pyogenic infection for a moderately long time. When the lung and the whole circulation is suffering from malarial, pneumococcus, or other forms of infection, the first serum effused contains one of these pathogenic germs. This, many bacteriological experiments have demonstated. The antecedent infection is responsible for the low vitality of the pleural surfaces and for the want of germicidal power in the effused serum itself.

In the same manner, tubercular effusions in the pleural cavities become infected from suppurative bronchitis with the pus microbes and a true empyema follows a tubercular effusion.

There are instances in which coagulation takes place in the effused serum, and larger or smaller clots resembling white thrombi fill the space between the pleuræ. If the effusion takes place very rapidly, it may contain red blood corpuscles, and these again may be found in the clots. The cavity may be so filled with these fibrinous masses as to resemble a sponge. After the absorption of the serum, the solid portions of the effusion may be left behind and give rise to anomalous physical signs. When such a pleuritis becomes suppurative it is difficult to drain and it is wholly insusceptible to treatment by aspiration.

The indications for operating in cases of empyema depend very largely on the character of the infection. It may be stated in general terms that the serous pleuritic effusion is from the nature of the origin of effusions charged with the primary infective material; thus, in specific pneumonia, with the pneumococcus; in malaria, measles and influenza, with the organism which gives rise to the pneumonias of these diseases. These infective materials are ordinarily incapable of producing suppuration under any circumstances, and their infective powers are limited in destructiveness and in time. Such serous effusions are ultimately completely absorbed without any loss of function in the parts concerned.

Suppurative empyema is due, as a rule, to the pyogenic staphylococci or streptococcus. A great number of investigators have found these alone or mixed with the infective parasite of the primary disease. It matters little which one of the pyogenic bacteria is the originator of the suppuration. It is in any case essentially progressive and destructive; there is only the remotest hope of the absorption of the pus. Two methods of termination have been observed. The pus has either been discharged through the thoracic walls or into the respiratory passages.

Beside the non-destructive pleuritic infection and suppurative pleuritis or true pyothorax, there remains one other important pathological and clinical manifestation of pleuritis, that is tubercular pleuritis.[6]

[6] The relation of tuberculosis to pleuritis is one which has aroused a great deal of discussion, and the matter is not settled, simply because the

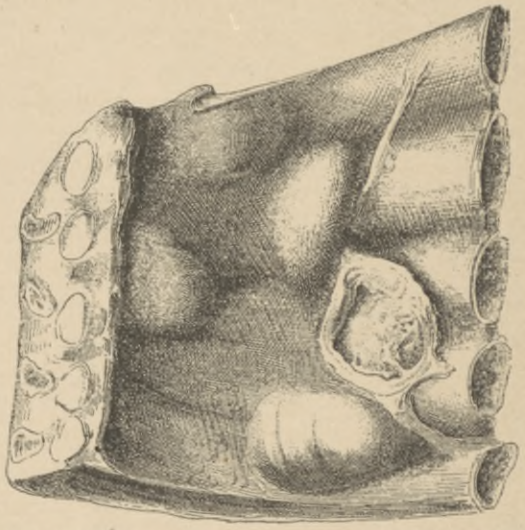
Pyæmic pleuritis occurs in the course of osteo-myelitis, carbuncle and other suppurative diseases, and usually has the staphylococcus pyogenes aureus in the exudate. The streptococcus pyogenes is usually found in those cases which occur in puerperal sepsis or wound diseases. In tubercular pleuritis the tubercle bacillus is found only with difficulty. The presence of other bacteria is without clinical significance. This originates from infection of the pleura from neighboring tubercular organs, and principally from tubercular disease of the lungs. While it has been observed without other antecedent forms of pneumonia it is prone to follow non-tubercular and non-suppurative disease.

True or pyogenic empyema may arise from the puncture of the pleural cavity with an infected instrument. It was occasionally declared before the antiseptic period, and even well into it, that thoracentesis was followed, as a rule, by suppuration. This is denied by the methods and practice of modern operators. It does, however, occasionally occur. Gunshot wounds and stabs with sharp instruments without perforation of the lung and without pneumothorax is occasionally, if not as a rule, followed by suppurative pleuritis. That the perforation of the lung and consequent pneumothorax is not invariably followed by infection of the cavity is due to the germ-free condition of the air which has traversed a considerable distance through the moist bronchioles.

investigations have taken either too much of a clinical, or too much of a pathological outlook. The matter is well stated by A. A. Smith in the *Medical News*, July 9, 1890. He reaches the following conclusions: *First.* If it be true that the very large majority of cases of pleuritis, not traceable to ordinarily recognized causes, are tubercular, we have no clinical method by which the fact can be proven, and the assumption that they are tubercular can only be by inference. *Second.*—If such a large majority of pleurisies, as many seem to believe, are of tubercular origin, recovery from tuberculosis of the pleura is much more frequent than from pulmonary tuberculosis. *Third.*—The prognosis in purulent pleural exudate is more favorable as to the subsequent development of tuberculosis than in serofibrinous exudate. *Fourth.*—That even though in an autopsy, evidences of pleuritis recent or old may be found, it does not necessarily follow that the pleuritis is tubercular, because there are tubercular lesions in the lung. *Fifth.*—It is fair to assume from the frequent associations, *post-mortem*, of recent and old changes in the pleura with pulmonary tuberculosis, that many of these changes are tubercular in origin, although at the time of death tubercles are not found in the pleura. *Sixth.*—In cases of pleuritis, although evidences of tuberculosis exist in the lungs, as shown by physical signs, and by the presence of tubercle bacilli in the sputa, it does not necessarily follow that such cases of pleuritis are tubercular in origin, although they probably are. *Seventh.*—In cases in which pulmonary tuberculosis develops subsequent to a pleuritis, there is probably the same underlying cause for each."

It must be remembered that in cases of pyæmia, pyothorax may arise and is to be accounted for in the same manner as in other forms of sepsis.[7]

Tubercular empyema may follow the perforation into the pleural cavity of a tubercular peri-pleuritic abscess going out from a tubercular osteitis in one of the ribs or vertebræ, or from a tubercular mediastinal lymph gland, and pyogenic empyema may arise from true pus cavities in the same localities.[8]



MULTIPLE TUBERCULAR OSTEITIS OPENING IN TO THE PLEURA. (*Riedinger.*)

The indications for operation, depending on the quantity of effusion, differ in respect to urgency the same in all kinds of

[7] A. B. Marfan puts all cases of pyothorax into three etiological categories. Those that follow pneumonia are characterized by the presence in the exudate of the pneumococcus; those that occur in the course of pyæmia, by the presence of the staphylococci or the streptococcus, and those which follow tuberculosis, by the presence of tubercle bacilli. Clinically the same divisions prevail. The pneumococcus effusions appear in patients thirty years old or younger, and most frequently in children. The course of such empyemas is favorable, and spontaneous absorption may take place, secondary infection with suppurative bacteria marks an unfavorable accident which requires operation.

[8] Riedinger and other authors mention the occasional perforation of an abscess in the thoracic wall into the pleura, but antecedent adhesion usually closes off the pleura and an opening is effected, if the patient survives, into the bronchi. Tubercular empyema has resulted occasionally from the opening of a tubercular abscess going out from a tubercular rib. This can be readily understood from the accompanying cut.

empyema. Thus the effusion may be so great that it diminishes the lung capacity beyond the limit of existence. Life may thus be threatened in a one-sided effusion of such extent that it encroaches upon the cavity of the other lung, or when the opposite lung is already useless from pneumonia or other causes. In such cases the effusion must be immediately removed on account of its mechanical danger to life. The same may be said of such cases as are complicated by great interference with the circulation of the blood. Effusions, of even small extent, in both pleural cavities become dangerous, especially when complicated with pneumonia or bronchitis.

There is another less urgent, but not less positive, indication for operation in those cases of effusion which are infected with pyogenic bacteria. It matters not what the original effusion may have been, or what the condition of the patient may be in other respects, the presence of a suppurative disease in the pleural cavity, or in both of them, is a positive indication for immediate and *permanent* removal. The suppurative disease is progressive and destructive, and never terminates favorably except in drainage and cicatrisation of the suppurating surfaces, and closure of the cavity. The temporary or interrupted drainage of the pleura is not adequate in such cases, and cannot meet the positive indication.

The treatment of tubercular effusions into the pleural cavity may be stated in almost as positive terms. It is assumed that the tubercular infection is unmixed with the suppurative disease. The *locus* of tubercular disease is assumed to be in the lung and beyond the power of the operator to remove. The effusion is not usually large, and is apt to be circumscribed by adhesions. The wall of the cavity is covered by tubercular granulation tissue and is sometimes found little more than a tortuous tubercular channel. Drainage by free incision is followed sooner or later (and in spite of the most careful antiseptic treatment), by pyogenic infection of the tubercular tract, and, when the opening begins to close, by symptoms of sepsis. Neither simple incision and antiseptic irrigation nor the excision of a portion of a rib and *evidement* of the cavity is followed by speedy recovery. The tubercular disease in the other part of the thorax is apt to speedily carry off the patient. It may be said that there is no positive contra-indication to operation

on tubercular empyemas, and that they may be operated on when there is any special indication. This special indication may be found in the size of the cavity, in the accessibility of the original focus, or in the otherwise healthy condition of the patient. That the drainage of tubercular pleuras should not be undertaken with any favorable prognosis, except in the young, and when these follow tubercular disease in an accessible bone or other part and is not accompanied by extensive disease in other parts of the thorax, passes without saying.

In removing pleuritic effusions a great obstacle is met in the contractility of the lung and its tendency to immediately collapse and retract to the upper and posterior part of the thorax under the pressure of the atmosphere. This is a difficulty nowhere else met with, and one which has long been looked upon as sufficient to interdict the opening of the pleural cavity under any circumstance. This is termed the elasticity of the lung, and it has been estimated by Hutchinson to be equal to one-half pound to the square inch. The pleural cavity may be opened into a partial vacuum and the collapse thus avoided, or the function of a single lung may be dispensed with. Thus we have two principal methods of draining the pleuræ—the one into a vacuum, and the other against a full atmospheric pressure.

Of all the methods of removing a pleuritic liquid effusion, that originally proposed by Stanski is the simplest and attended with the fewest dangers. This is the aspiration with a small trocar which has come so much in vogue since the perfection of the apparatus. For effusions which are infected with micro-organisms of a non-destructive character, and for those effusions which are removed solely on account of their extent, it is the most serviceable and desirable method. It is not to be used in cases of pyogenic infection with the hope of effecting an arrest of the destructive disease. However, when so modified as to be used continuously it may be of the greatest advantage to those adults who can have the necessary attention from skilled nurses or physicians, and when it is instituted early enough to preserve the elasticity of the lung. When advantage is taken of the weight of a column of antiseptic solution for the aspirator this becomes the recently much lauded method of Buelau. Whether it can be depended upon for the com-

plete removal of the products of suppurative pleuritis, experience has not yet adequately demonstrated. It seems to promise the most favorable results when instituted early and so vigorously as to remove nearly all the effusion, and, at the same time, bring the granulating pulmonary and parietal pleural surfaces together and secure a rapid obliteration of the cavity. It would accomplish enough if it would do this and limit the effusion to a small cavity, which could be afterwards drained by incision. It is the only method which can be used in bilateral pleurisies of great extent. It commends itself to the patient as a less formidable operation than incision or rib-resection, and would, therefore, be likely to be undertaken early. With a proper apparatus to be made from any exploring aspirator and a long rubber tube, it is within the reach of every physician, and the difficulties and dangers of thoracentesis with constant aspiration are not great. The feeding of the siphon with an antiseptic solution on the principle of a Sprengel pump, as here proposed, may be found to be a safeguard in filling the tube which might become clogged or full of gases.

Delayed evacuation of the pus may not in every case be followed by adhesions or limitation of the elasticity of the lung. Dr. Weiss, of Ottawa, Illinois, reports a case of insanity committed to the Kankakee Asylum for several months, discharged to die of phthisis, in which he drained an empyema with complete recovery from the insanity and the phthisis.

O. Ward discusses the relation of melancholia to empyema. That such cases are exceptional may be seen from a perusal of the literature. Squire reports a recovery from melancholia and restoration of the function of the lung after draining an empyema which had been present four years.

Lewinsky practices for about ten minutes, after each aspiration of the effusion, rythmical compression of the affected side of the thorax. He succeeds in this way both in bettering the subjective condition and in shortening the disease by hastening the absorption of the remaining fluid.

The only remaining method of treatment consists in free incision and drainage. This is accomplished in a number of ways.

An incision is made in the axillary line and at the upper border of a rib into the centre of the effusion. The finger is passed into

the incision and any information gained which the palpation affords. A rubber or other drainage tube is passed on the finger or forceps into the cavity and placed in the most advantageous position for drainage. The cavity may or may not now be washed out with a warm antiseptic solution and carefully dressed. This antiseptic irrigation and dressing are to be repeated every day with the most conscientious care and scrupulous antiseptic precautions. At the end of a week or two the discharge of pus will be found to have disappeared. Then if the method of Professor Quine and Bouvert is to be followed a still more careful antiseptic irrigation is to be employed, and the tube removed entirely, and the hole in the side stopped with a stick of iodoform. The dressing is left on for two weeks or more, and the air and other contents of the cavity left to be absorbed by the now clean and healthy pleura. There is no reason why this should not fill all the indications of any operation, viz.: First, to evacuate the pus. Second, to prevent the production of more purulent matter, and third, to restore the respiratory apparatus to its normal condition. I must admit that while there is no reason to think that the pleural cavity may not thus be sterilized, our experience has been so unfortunate that until Professor Quine reported his cases it had not been regularly practiced.

At the German Congress for Internal Medicine referred to, Mosler alone advocated simple incision and drainage. The treatment most favorably received there was Buelau's method and the subperiosteal excision of a rib and drainage without antiseptic irrigation.

As to the site of operation, it must be admitted that a great many mistakes have been made both by writers and operators, and Godlee alone has put the matter exactly. The retraction of the diaphragm is more rapid than the retraction of the lung, and the opening into the thorax should be at least as high as the centre of the effusion in all cases in which drainage is made against the atmosphere. In case drainage is made into a vacuum after the manner of Buelau, the locality of the fissure between the lobes of the lung presents some obvious advantages. Dr. Marshall's muscle-free spot is certainly too far forward. The drainage can be better accomplished in the axillary line notwithstanding the amount of muscle and fascia.

The second method of drainage against the full atmospheric pressure is incision, counter-incision and through and through drainage. This method certainly secures better drainage and gives an opportunity for irrigation without danger of distending the cavity and interfering with the retraction of the lung. It hardly offers the best means of restoring the respiratory organs to their normal condition. It is the method which would be least likely to be received by the patient, and it has few advocates except in England.

The subperiosteal excision of a large portion of a rib and the

LOWER PART OF THORACIC WALLS ON THE RIGHT SIDE. (*Godlee.*)

A, pectoralis major; *B*, pectoralis minor; *C*, serratus magnus; *D*, external oblique; *E*, rectus abdominis; 3, third costal cartilage; 4, fourth costal cartilage; 5 5, fifth costal cartilage; 6 6, sixth costal cartilage; 7, seventh costal cartilage; 8, eighth costal cartilage; 9, ninth costal cartilage; * placed just above Mr. Marshall's spot; † aponeurosis, common to external oblique and pectoralis major and covering rectus; ‡ xiphoid appendix.

drainage of the cavity by one or more tubes through the defect thus established. This is the method to be used in all cases which cannot have the care of a skilled nurse and the care of a careful

and scrupulous physician. The drainage is established in the most comprehensive manner and is accompanied by the fewest dangers. It is the method best adapted to those cases that must take care of themselves.[9]

Through and through drainage and insufflation of dry air. This method offers the same advantages as perrigation with the advantage of scab formation and destruction of the infection by dessication.

The perflation of air has also (1866) been practiced by Roser, and later, combined with antiseptic liquid irrigation, by Quincke and by Ewart and Fitzroy.[10]

When pyogenic and non-tubercular empyemas are treated by any one of the preceding methods early in their formation, there is the greatest hope of a restoration of the functions of the respiratory apparatus to its integrity. When treatment is inadequate to meet the indications, or when it is delayed, such serious changes take place in the thorax that new indications arise. Thus spontaneous discharge of the pus may take place through the bronchi, and the cavity formerly filled with pus will come to be occupied with pus and air. If the cavity is small, or favorably situated, it may drain sufficiently into the bronchus to close, and recovery will be nearly perfect. Again, if drainage is not instituted early in the course of the disease, the lung will be pressed back and up and adhesions will be formed between the walls of the thorax, and the collapsed and shrunken lung, which will prevent its ever being able to fill the pleural cavity again. This compression, with coincident infection, may result in gangrene of the lung and in the invasion of the empyemic fluid and the dead tissues by saprophytic bacteria and other organisms and the production of a complicating sepsis

[9] Conitzer offers the results of 20 cases of empyema in children, ranging from ¾ to 9½ years of age. Of these, 4 were treated by simple puncture, 2 by excision, and 14 by partial rib resection. The latter show the best results. Thirteen recovered completely, 2 died from broncho-pneumonia and tuberculosis, while two had permanent fistulæ remaining. He thinks empyema in children should be operated upon as early as possible and that resection of a rib should precede all other methods.

[10] The following method is employed by Fürbinger in such cases of pleuritic exudations as are of long standing, and with little pressure. He takes advantage of the sucking power of the mouth to remove the fluid. A glass tube entering the bottom of an irrigator bottle is connected with the trocar by means of a rubber tube. Another tube from the top of the bottle is used as an exhausting tube.

of a grave nature. This invasion takes place from the bronchial tubes which are always filled with saprophytic bacteria and other putrefactive organisms.

When such adhesions or such destruction has taken place before the case comes to treatment, or when the methods instituted have been inadequate to close the cavity entirely, it may be necessary to depress the thoracic wall so that it will come in contact with the surface of the collapsed lung. This is done by the excision of a sufficient number and extent of ribs to meet the indication. (*Estlander.*)

This review of the etiology of pyothorax makes it possible to formulate the following positive indications for operation:

1. Serous effusions must be removed whenever they interfere with respiration or circulation by their extent or when they show a tendency to remain after recovery from the primary disease which gave rise to their presence. The aspirator may be found sufficient in these cases, but when inadequate after repeated trials, one of the more radical and permanent methods of drainage must be resorted to.

2. Pyogenic and tubercular effusions of large size or of small size must be immediately and permanently drained.

3. Drainage into a vacuum must be practiced in all cases of bilateral effusion without adhesive limitation, and in those cases of unilateral effusion in which the opposite lung is so incapacitated as to be inadequate for respiration. It may be practiced in all cases in which the expansibility of the lung is intact and the patient can have skilled attention. It will be found of the greatest value in limiting the extent of the empyemic cavity, which may be afterward drained against the atmosphere.

4. Intercostal incision and antiseptic irrigation of the cavity to a point reaching a practically aseptic condition of the same and permanent closure of the incision is indicated when the expansibility of the lung is intact and the skill of the operator is sufficient.

5. Rib resection and thorough drainage should be practiced in all cases of tubercular effusion and pyogenic effusions which are not treated early, or those occurring in patients who cannot have the best of care.

6. Operation must never be delayed on account of the extreme

condition of the patient, nor on account of the presence of tuberculosis in one or both lungs, nor on account of the presence of pneumonia on the same side. All of these conditions are additional indications for radical operation.

Although the following histories are very incomplete, some of them will be found to contain interesting lessons. Their incompleteness itself is instructive because it shows how neglected the clinical material of this great institution still is, and it ought to spur the proper authorities and the medical profession in the city on to demand radical improvement. As it stands now the histories are written by the junior interne with no supervision except that of the senior interne or house physician, and no inducement except his own personal edification. Any attempt at thoroughness is discouraged by want of time and suitable diagnostic instruments and laboratory facilities. The wards are not open to medical teaching, and no reports have heretofore been made in which these efforts could be brought to notice. After they have been used at the bedside they have been buried in the files of the registrar. The interest of the attending men must be secured by proper facilities for daily medical instruction in the wards and annual or semi-annual reports in which histories may be utilized. Not till then will a greater scientific spirit prevade the hospital. In spite of all these discouragements, and working almost alone the house-staff has done a great deal in the last year to improve the method of keeping the records, especially for diagnostic purposes. Their future utility should be more carefully considered.

The fourteen cases here reported extended over a calendar period of one year, July 1, 1889–1890. Two patients died in the hospital, four made improvement, while the remaining seven were considered as recoveries. Five cases had had more or less lung trouble before entering the hospital. One case commenced with profuse expectoration, while the other suffered from night sweats. Dullness was marked over the lungs in both cases, and the respiratory sounds were impure. Both cases had a temperature of 99° to 102° F. One patient was aspirated four times before he was operated upon.

In my private practice I have had during the past year only one case of empyema which is worthy of record.

Case I. A. E., male, nine years old, had the influenza in December, 1889. This left him with poor nutrition, rapid pulse and pus in the urine. Some time in the month of February, there was an examination made under an anæsthetic for stone in the bladder. The bladder was found empty. He gradually regained his strength. The last of May he had a cold and when I examined him first, on the third of June, the right pleural cavity was filled full of fluid, the temperature was 100°, and the pulse 116 reclining, and there were twenty-six respirations to the minute. During the next ten days until the third of June, temperature gradually fell to 99° F. at night, the pulse to 96, and the respirations to twenty per minute. The effusion had so diminished that there was very good resonance and vesicular murmur as low as the sixth interspace in the axillary line. No aspiration had been undertaken, and the treatment consisted in the dry diet and saline laxatives. Such was the boy's condition that at noon, June 13th, I gave permission to move him to an aunt's residence a few blocks away where he could be undisturbed by some repairs which the house required. Before he was ready to go, and less than two hours after I saw him, he became very sick, but had no chill. Breathing became very difficult and speech almost impossible. He was obliged to sit up in bed and support himself with his hands, and his temperature rose in three hours to 104° F., the pulse to 140, and the respirations to 50 per minute. Early the next morning his condition was, if anything, still worse and the signs of right-sided pneumonia appeared.

Dr. William E. Quine was called in consultation and recommended draining the right pleural cavity of the effusion which was evidently a source of great respiratory and circulatory embarrassment. This was immediately done under chloroform anæsthesia by simple incision in the axillary line and at the upper border of the seventh rib. A few ounces of sero-purulent fluid escaped without the usual ingress of air. The finger was passed into the cavity and the solid lung was filling the whole right thoracic cavity. On the finger two drainage tubes were passed carefully downward and backward and the wound was packed with gauze and carefully dressed. There was great relief from dyspnœa after the operation, and the pain was more easily controlled by morphine. The patient was able to lie down and rested well. There was a con-

siderable wetting of the dressing found at each of the first three or four daily dressings. The cavity was irrigated with 1-4000 warm corrosive sublimate solution. The pneumonia began to resolve on the fifth day and the temperature was below 100° after the seventh day. From the first to the tenth dressing, there was a gradually increasing ingress of air through the tube on inspiration. The care in dressing and antiseptic irrigation was increased, and at the end of two weeks the tubes were entirely removed. The incision was stopped with a stick of iodoform and with powdered iodoform, and the whole covered with a large antiseptic dressing, firmly applied. This dressing was removed ten days later, during which time there had been no rise of temperature or unfavorable symptom. The incision was found closed and the pleural cavity free from air or fluid. The patient has rapidly gained in health, weight and strength, and the lung presents no abnormal signs. The pulse and temperature are normal. (Aug. 1, 1890).

This method of treatment was undertaken at the recommendation of Professor Quine. He told me he had treated an adult female patient for eight months by the most painstaking irrigation and drainage through a simple incision. The lung did not seem to advance at all to fill the cavity, and so he decided to render the cavity aseptic and close it permanently. He spent about an hour each day for ten days in carefully washing out the cavity. At the end of that time the discharge was trifling in amount and a thin serous fluid. He now irrigated the cavity with still greater care and stopped the incision after withdrawing the tubes, with iodoform. He applied a large antiseptic dressing which he left on for two weeks. The temperature did not rise a tenth of a degree above normal during all that time. The patient took on flesh remarkably, and when the dressing was removed the pleural cavity was filled with the now expanded and resonant lung. The air and any other contents of the pleura had been absorbed. The patient has remained well ever since—nearly two years. Since that time, he has treated six other cases in the same manner with equal success. A seventh case required rib-resection on account of suppurative osteo-myelitis induced by the contact of the drainage tube.

Treatment so radical can not astonish any one more than it did me. When Professor Quine described his exquisitely thorough

antiseptic dressings after equally thorough antiseptic irrigation, and the happy results following the permanent closure of a pleural cavity full of air with a lung which had been collapsed eight months, my preconceived ideas of thoracic surgery were overturned in a moment. The possibility of germicidal action in the pleura had been demonstrated by concrete experiment and by analogy. The surgery of the abdomen pointed to the possibility of a corresponding revolution in the surgery of the thorax and the proposition of closing the thorax, still full of air, after gunshot wound, had the demonstration of years of practice. The knowledge of the etiology of empyema, coming on as a rule when the germicidal power of all the tissues of the body and especially of the pleural surfaces is saturated by some septicæmic infection, encouraged the hope that the germicidal action of the pleura could be utilized to take care of a small amount of infection, perhaps "attenuated" by the protracted use of germicidal solutions. The absorption of the air or its expulsion by the inflation of the collapsed lung on forced expiration presented no difficulties, as the contractile power of the lung is only about the thirtieth of an atmosphere and the granulation tissue on the incision would act effectually as a valve under any such pressure and prevent the ingress of air.

This method could not of course be practiced in cases of tubercular pleurisy, nor in those in which foci of infection remained in the bones of the thorax, the lung or organized fibrinous exudation.

Case II. J. E. S., single, white, age 32, Irish.

Diagnosis. Lobar pneumonia right lower lobe, empyema right side. Admitted to the Hospital January 7, 1890, 3:30 P. M. Transferred to surgical side February 18th. Discharged recovered, July 11th.

Good family history. Patient had a chill this morning (January 7th), followed by temperature of 100° F.; complains of almost intolerable pain on left side. Bowels have not moved for three days. Has frontal headache and pain in back.

Respiration rapid, shallow and labored. Absolute dullness over lower lobe of right lung. Total absence of normal vesicular murmur, but bronchial vesicular respiration, harsh and dry, can be heard over whole extent of lung. Over the left lung, where

murmur is exaggerated and faint, pleuritic friction sounds can be heard. There was retention of urine from the first.

January 15th. Considerable pus mixed with blood was drawn from the right pleural cavity with the aspirator. On the 17th of January the tapping with the aspirator was repeated, and nearly a quart of serous fluid removed. Saline laxatives were freely administered, but on January 26th a quart of serous fluid was again removed.

On February 15th the temperature rose to 103°, and the patient was transferred to the surgical side to the service of Dr. J. B. Murphy on the 18th.

On the 19th of February the patient was operated on in the surgical clinic. The aspirator removed thick, yellowish fluid. The incision was made in the axillary line over 7th rib two and one-half inches long. The periosteum separated from the rib, and a piece of it two inches long cut out. An opening was made into the right pleural cavity with a large forceps, and a considerable quantity of pus and thick "grumous" matter was removed. A large drainage tube was inserted and a heavy dressing applied.

The dressings were changed every second day. The temperature fell to normal and the cavity closed rapidly. The patient was discharged from the Hospital with "no dullness, no deformity, and wound entirely healed."

Although the history is incomplete, there seems to be no reason to doubt the diagnosis of pneumonia in this case, though the "grumous material" and the small amount of serum removed by the aspirator at various times would cause one to suspect the early appearance of a coagulated fibrinous exudate. The indications for expectant treatment were inadequate and the persistence of temperature, the return of the exudate were indications for prompt and permanent drainage. If there were large masses of fibrinous material it would have rendered drainage into a vacuum by Buelau's method difficult or impossible.

Case III. P. O'L., single, white, age 24, laborer.

Diagnosis. Abscess of lung; empyema. Admitted to hospital July 1, 1889. Discharged July 9th.

Family History. Father and mother living; three sisters and one brother living; all healthy. Eleven brothers and sisters dead;

all died in infancy. Smokes and chews tobacco to excess. Denies any venereal history. Has had numerous accidents, all from "lickings." Five years ago was shot through the neck, came to the hospital, and recovered in a very short time thereafter. Four years ago was stabbed four times in the back at one time, and twice another time, but these injuries were quickly healed. Never had been sick at all otherwise.

Present Illness. On the 10th of February last was shot in the breast. The bullet, of 38 calibre, leaving a scar an inch to the left and above the right nipple. The bullet was removed and he thought that he was fully recovered. About the first of May the patient began to have a "stinging" pain in the right breast, and then began to cough. The first expectoration seemed like phlegm. At this time he was very feverish and went to bed. Two days after going to bed patient had sensation of gas in his throat; says he turned over and half vomited, half spit up, more than a cupfull of yellow pus. For four times in four successive weeks he had spells of vomiting "this pus," but not so much as the first time. The last time was about the 10th of June, since then the expectoration has been decreasing in quantity. Patient does not cough much now except on going to bed and in the morning when he first gets up. Lost 40 pounds flesh.

Examination. July 2d. Well developed, though evidently somewhat emaciated. Loss of motion over right chest. Apex beat one and a half inches directly below nipple. Over lower right chest below a line commencing one and a half inches below nipple and extending in nearly straight line to lower angle of scapula and thence to vertebral column, is increased dullness, vocal fremitus and resonance. There is nearly complete loss of respiratory sounds over this area. A faint systolic murmur at base heard in second interspace near right edge of sternum.

Pulse on admission was 98, temperature 99°, respiration 36. Discharged, without operation, eight days after admission.

Case iv. T. M., single, white, age 34, miner, Irish.

Diagnosis. Empyema. Admitted January 23, 1890.

History. Thirteen months ago patient had pleuro-pneumonia, with effusion into the right pleural cavity. Since then has been bedridden for the past eleven months. Has never been able to lie

upon the left side. Two weeks before admission he was operated upon at St. Luke's Hospital, tubes being inserted for drainage. Two days before he left St. Luke's Hospital he says about two pints of pus were withdrawn. During the time since pneumonic attack has coughed a good deal.

Examination. Shows tubes in axillary line as above noted. Patient thin; flesh wound on right lower jaw, where alveolar abscess had been lanced, is just healing.

January 24th. Irrigation through tubes. Very little discharge. April 10th, removed one tube, and left one in. Discharged May 5, 1890, improved.

CASE V. D. M., single, white, age 25, teamster, American.

Diagnosis. Pulmonary tuberculosis, with empyema and nephritis. Admitted to Hospital May 5, 1890. Patient transferred to surgical side for operation, May 11th.

Urine. Reaction, acid. Specific gravity, 1023; small amount of albumen present, with granular casts.

Family History. Negative. Patient has used beer and brandy for eight years; chews tobacco. Denies ever having had gonorrhœa and syphilis. Was in this Hospital for about a week five months ago, in Ward 3, after which time he left feeling somewhat better, but has not been well since.

Present attack began five months ago, after exposure to cold and wet, with a severe cold, cough, etc. Has had anorexia ever since. Has lost about 40 pounds weight; has been troubled with shortness of breath on exertion for the past four months. Hoarseness for about two months, which is very marked at present. Has had a sharp lancinating pain in the chest, mostly on the left side, at intervals.

Examination. Patient is emaciated and somewhat anæmic. His hands are blue, and the white spots, made by pressure, remain for some time; fingernails claw-like; tongue red and moist; no skin lesions; no œdema. Respiratory movements are impaired on the left side. Flatness over entire left chest, posteriorly, and up to third rib anteriorly. Dull over left upper lobe anteriorly. Respiratory sounds absent over the left side posteriorly, but a faint rubbing sound is heard with both inspiration and expiration. Right—exaggerated respiratory sounds over right lung, mucous

râles and bronchial breathing; dullness over R. U. L.; cardiac impulse in second, third and fourth left interspace near sternum; apex beat, absent. Second pulmonary sound very loud and somewhat impure. Right border of cardiac dullness corresponds with right border of sternum. Spleen, apparently enlarged; liver, dullness lower than usual; epigastric pulsation. Needle inserted in two places in axillary region finds nothing.

May 8th. Pulse 96, temperature 102°.

May 11th. Bulging of left side well marked. Needle inserted further back finds pus. Aspirated in 8th intercostal space post axillary line, withdrew about 40 ounces of greenish pus. After aspiration, pulmonary sounds could be heard only as low as lower border of third rib. Below this in front, and about the same level behind, a loud, moist, friction sound was heard. Resonance semi-tympanitic over lower anterior and lateral aspect of left lower lobe. Friction sound synchronous, with cardiac impulse over mitral area.

Operation. Incision was made over 7th rib in axillary line, transversely, about three inches, fascia and muscles cut through, and the periosteum covering the rib peeled back. About two inches of the rib were removed with bone-cutting forceps, then the intercostal muscle cut through, and a considerable amount of pus evacuated. A large drainage tube was inserted into the cavity and fastened *in situ* by suture. The cavity was thoroughly irrigated with sterilized water. The operation was done almost without anæsthesia. Chloroform at first was given, and later some ether, but patient took both very badly, becoming black in face, and having a weak pulse. The anæsthetic was suspended, and operation finished without it.

May 15th. Dressing removed, and pleural cavity irrigated with sterilized water; considerable quantity of pus evacuated. Dressed daily; disease continues, patient coughs, and is emaciated.

June 24th. Patient's temperature suddenly rose to 106° F., and death occurred within a few hours. There was good drainage and no cause could be found for the temperature. No autopsy.

Case vi. J. C., single, white, age 20, Irish.

Diagnosis. Empyema. Admitted August 22, 1889.

Family History. Good. Uses beer only, and not much of that;

smokes some, but does not chew ; no venereal history ; previous history good ; had measles when a child.

Present Illness. Commenced about five weeks before admission. Patient had an attack of pleuritis on the right side, this side having been next to the window, and was rained on during the night while asleep. During this time he had some medical attendance and applied mustard and other plasters to the side. After this, he was admitted to the Hospital. On the night of admission, resection of the seventh rib was performed under chloroform, and the cavity cleaned out. Since that time it has been irrigated every two or three days, and an irrigating tube placed in the opening and iodoform gauze and bi-chloride dressings applied over all. At the time of writing this history (September 23d), the patient says he has gained more flesh than he has ever had at any time before admission. The discharge is growing less gradually, and the wound has entirely filled with granulations, except at the point where the tube is inserted. Highest temperature reached was 102.4°.

October 3d, wound irrigated and dressed.

October 7th, dressed wound and irrigated it; looking better.

October 20th, dressed.

October 28th, very little discharge from wound.

December 4th, removed tube.

Discharged, completely recovered, December 21, 1889.

Case VII. B. S. V., age 9, American.

Diagnosis. Empyema. Resection of 6th rib. Admitted to Hospital, August 22, 1889.

On the 28th of January, 1889, this little boy was taken sick with measles. In two weeks' time, his physician said he had malarial fever. By March, the patient was very weak, and parents decided to change physicians. At this time, a tuberculous form of disease was diagnosticated. The patient had a persistent cough from February to June, when, on account of effusion into pleural cavity, the left side was lanced. From four to five ounces of liquid, of a dark color, was discharged ; not offensive ; about the consistency of milk.

On the 26th of June, the cavity, at another point, was opened.

This time a very offensive discharge took place. Since that time there has been a continuous offensive discharge.

Operation. August 30th. Left side was scrubbed, shaved, and made clean. An incision, three inches long, was made over the 6th rib and parallel with it, the periosteum retracted, the chain saw passed under the rib, which was sawn through, taking out a piece two inches long. Contents of cavity evacuated, and washed out with a sublimate solution, 1 to 5,000, and a drainage tube was then inserted and a dressing applied. Highest temperature reached was 102.4°, September 20th.

September 26th. Dressed every other day, except for the past two weeks, when wound was dressed twice a week.

Discharged October 6, 1889, improved.

Case viii. J. G., single, white, age 17, printer, Swede, was admitted to Hospital December 28, 1889.

Diagnosis. Lobar pneumonia — empyema. Transferred to surgical side February 1st.

One day last week patient had a chill, which was followed by fever; pain in the right chest near the nipple, which was exaggerated by breathing and coughing. Face is flushed; tongue coated with whitish fur. Respiration is rapid and panting in character. Expectoration is tenacious. The entire right lung is consolidated. Dullness on percussion over entire lung; expansion is diminished. Breathing is bronchial in character. Heart's action rapid.

Conjunctiva of left eye inflamed, and discharging quantities of purulent material.

January 12, 1890. Examination reveals dullness over whole right lung, bronchial breathing and bronchophony; no râles. Fine moist râles in lower quarter of left back.

January 31st, at 2 P. M. Needle inserted in the eighth interspace near angle of scapula draws a creamy fluid. 7 P. M., aspirator draws five pints of fluid like above. Transferred to surgical side February 1, 1890, when the following history is recorded.

Patient gives no tubercular history in his relatives; had no cough before he came to the Hospital.

Examination revealed dullness on percussion over right lung; bronchial breathing, and bronchophony. Heart in normal condition.

Liver somewhat displaced downward; expectorates some white sputum.

February 5th. The patient was operated upon in Dr. J. B. Murphy's clinic. An aspirator was inserted to see how far down the cavity extended, and it was found to be below the ninth rib behind the axillary line. The ninth rib was resected about two inches back of the axillary line, about $\frac{3}{4}$ of an inch was removed. A large quantity of creamy colored pus flowed out through the opening. A drainage tube was inserted, and antiseptic dressings applied. Dressed daily at first, then as often as necessary to keep clean.

Discharged May 29, 1890, recovered.

Case IX. John D., married, white, aged 30, Irish, was admitted to the Hospital May 16, 1890.

Diagnosis. Empyema.

Family History. Negative.

Previous Diseases. None, except some lung trouble during the winter.

Present Illness. Began three weeks ago, commencing with a chill, followed by fever. Patient coughed some at this time, but did not expectorate much. Since then has been growing steadily worse; has lost weight and strength; gets weary and tires easily; slight cough. Right side is somewhat increased in circumference; *inspection* shows abnormal rotundity, and apparent bulging on right side; *palpation*, vocal fremitus lost. *Percussion* shows dullness from the second to the fourth rib on the right side; flatness extreme from the third rib in the infra-mammary region.

Operation. May 17th. Ether was administered as an anæsthetic. Incision of the eighth rib parallel to it well back, after obtaining pus through exploring needle just below it. Subperiosteal resection of one-half inch of rib. Pus now escaped itself without further cutting, about two quarts having been evacuated. A gauze plug was put into the opening, and an antiseptic dressing applied.

May 18th. Examination of urine showed a large quantity of albumen present. Casts, hyaline, epithelial; specific gravity, 1028, slightly alkaline; no pus; no blood. Deposit of uric acid.

Small amount of mucus. May 21st, large rubber drainage tube inserted. May 23d, discharge considerable. June 21st, discharge slight. Small piece of tube keeps the opening patent.

Discharged June 21st, improved.

Case x. H. J., single, white, aged 29, railroad man, American, was admitted to the Hospital April 12, 1890. Transferred to surgical side April 16, 1890.

Diagnosis. Empyema.

Family History. Good. Uses whisky to excess; smokes and chews; had gonorrhœa eight years ago.

Previous Illness. Rheumatism 8 years ago; typhoid fever when a child. Present attack began with a chill seven weeks ago, followed by severe pain on motion and respiration on left side; no cough for one week afterward. Cough has gradually grown worse. Expectoration is very profuse and of a whitish color. Pain on left side improved under treatment, but is now about as severe as before. Bowels regular; appetite good; night sweats for about four weeks.

Examination. Shows emaciation; tongue clean; cough, and profuse white expectoration; pain on left side in axillary region on coughing. Vocal fremitus unchanged. Tenderness on left side most marked in axillary line. Respiratory movements decreased. Some dullness; broncho-vesicular breathing and bronchophony in right supra and infra-clavicular region. A few subcrepitant râles in left axillary line about fourth to eighth rib. Patient cannot sit up for examination.

Heart. Murmur with second sound of heart; heard best at apex, which is displaced about one and a half inches to right and over second left intercostal space, transmitted faintly into vessels of neck.

April 21st. Has had some sharp pains two or three times during the day in left side. Examination shows a friction sound synchronous with heart, heard over a circle of about one inch in diameter covering nipple. Dullness and diminished vocal fremitus and vocal resonance over *post* aspect of left lung up to about the level of the angle of the scapula. Respiratory motion impaired on left side. Exploring needle shows a thick white pus.

April 22d. Operation. Ether was administered as an anæsthetic. An incision was made over the 10th rib parallel to it through periosteum about four inches long. Periosteum was removed with periosteotome from exposed segment of rib and two or two and one-half inches of rib removed with bone forceps. An incision was made into the pleural cavity when pus escaped; the opening was enlarged by tearing. The pus was yellowish-white in color, and had no bad odor; cavity outlined with finger, its limit being reached in all directions and seemed to be shut off by adhesions. Wound irrigated with sterilized water, and a large drainage tube was put into the opening well up to the cavity. The superficial wound about the tube was closed with silk sutures, and an antiseptic dressing applied.

May 27th. The seat of the operation has been redressed every third or fourth day since the operation, the tube being gradually cut off at intervals, the pleural cavity irrigated, until at present signs of effusion are absent, and the wound closed. Patient feels much improved.

Discharged April 27th, recovered.

Case xi. Edward S. F., single, white, age 45, traveling salesman, American. Was admitted February 23, 1890.

Diagnosis. Pleurisy; empyema. Transferred to surgical side March 13, 1890.

Family History. Negative. Patient drinks to excess and admits recent indulgence in "whisky and quinine" as medicine. No previous illness.

Present trouble began three days ago with chilly sensations, nausea, constipation, pain in right side of chest and in abdomen; short catching respirations. Patient states that he had "La Grippe" four weeks ago and has coughed some ever since. Two weeks ago he was in Ward 3 a few days, and says he had a pulmonary hemorrhage then of considerable extent.

Examination. Patient groans and makes frequent complaints; appears to suffer much pain. Respirations are short and shallow, 30 per minute. Occasional cough, expectoration of white, foamy material. It is difficult to examine the chest on account of noise and restlessness of patient. Abdomen distended and tympanitic

—a few vesicles from large sinapism. Pulse strong and full, 100 per minute.

February 23d, 7 P. M., temperature 103.2°; pulse, 102; respiration, 30. Calomel and bicarbonate of sodium ā ā gr. v.

February 24th. Examination. Flatness in lower right chest, reaching in front to fourth rib, and behind to upper third of scapula. No vocal fremitus; diminished voice and respiratory sounds. Vesiculo-tympanitic resonance and bronchial character to breathing over right upper front. Patient is nervous, respirations shallow, but not very frequent; complains of pain in right lower chest and abdomen. Needle inserted in the 7th interspace in front of right scapula draws clear straw-colored fluid with whitish flakes floating in it. Aspirator removed o_j fluid—reddish, and containing flakes of yellow material.

Operation. Under ether an incision was made (three inches in length) over the middle of the seventh rib, just below and behind the inferior angle of scapula of right side. With periosteotome the periosteum was removed from both inner and outer surfaces of the rib, being careful not to wound the intercostal artery and nerve. With bone-cutting forceps two inches of rib were removed. The pleura was punctured with Billroth forceps; about a pint of greenish-yellow pus escaping. Also, large masses of cheesy substance were forced out by respirations. A large rubber drainage tube was inserted and sutured to the wound in the skin, after which a dry, antiseptic dressing was applied.

Discharged May 22, 1890, recovered.

Case xii. Henry O., single, white, age 26, laborer, Irish, admitted to Hospital May 31, 1890.

Diagnosis. Empyema (right).

Family History. Good.

Previous Illness. Says he had lung trouble last summer and was in bed several days. Has had gonorrhœa.

Present History. Has been sick for two and one-half weeks. Began by sticking pains in right side of chest, and chill. Very profuse night sweats. General appearance fair; tongue coated in center. Coughs and expectorates mucus.

Physical Examination. Reveals dullness over lower lobes of lungs. Vocal fremitus increased over upper lobes. Respiratory

tones are harsh. The expiratory tone is prolonged and high in pitch. Râles are heard more over lower lobes, and a pleuritic friction sound is heard over upper lobes. Heart's action weak, rapid and irregular. Abdomen shows slight tenderness on pressure. Respiratory sounds diminished over right lower lobe. Introduced hypodermic and obtained turbid, yellowish fluid, which, under the microscope, was found to be crowded with leucocytes.

June 1, 1890. Patient was sent from medical side with diagnosis of empyema, and tuberculosis pulmonum. Examination shows flatness on percussion over almost entire right side, and aspirating needle introduced between seventh and eighth ribs draws pus.

Operation. June 2. Chloroform administered. An incision was made over the eighth rib, about one and a half inches in length, down to the rib; periosteum of rib was then incised and pushed up with periosteotome. The rib was then snipped off with the forceps and about one inch removed. The pleura was opened with the Paquelin cautery, but no pus followed. Deciding that it was too low for the cavity, an incision was extended and the seventh rib removed for a like distance in the same manner. The cautery was again used, and entered the pleural cavity. Its withdrawal was followed by a large quantity of foul smelling pus. The opening in the pleura was enlarged with the finger and a rubber drainage tube introduced. The external wound was partially closed with three sutures and the tube included in one. A large antiseptic dressing was applied.

June 4th. Dressings were found saturated with pus.

June 6th. Patient died of tuberculosis pulmonum.

Case xiii. William S., single, white, age 17, mechanic, English, was admitted February 2, 1890.

Diagnosis. Empyema of right pleural cavity.

Family History. Mother died after giving birth to a child. No venereal history. Moderate drinker. No previous illness.

Present Illness. Patient has been ill for the last four weeks. Pain over the abdomen. Coughs a great deal; expectoration, large in amount, yellow. Bowels constipated; appetite poor.

Physical examination reveals dullness on percussion over entire lung, except apex ; this dullness is variable when position of patient changes. The normal vesicular resonance is absent.

Empyema being suspected, the exploring trocar revealed the presence of bluish pus, and aspiration being done about four pints of pus were evacuated from the right pleural cavity.

February 5th. Patient was transferred to Ward 6, and was operated on by Dr. Murphy in clinic. He resected subperiosteally about one-half to three-quarters of an inch of the seventh rib. A large amount of pus came through the opening. A drainage tube was inserted and fastened with a ligature; antiseptic dressings were applied.

February 8th. Dressing changed every day, not much pus discharged, but a large quantity of sanguinolent fluid saturates the heavy dressings.

May 29th. Patient has been dressed once in four to six days. Discharge has been gradually growing less until at present it is very slight. Night sweats continue, but cough is slight, and patient seems to improve best by outdoor exercise. Discharged, condition improved.

Case xiv. William C., married, white, age 35, Irish, was admitted April 28, 1890.

Diagnosis. Empyema of the right pleural cavity; nephritis.

Family History. Good. Has drank whisky and beer to excess for years; smokes and chews. Denies any venereal history.

Previous Illness. Measles; has always been well and strong.

Present attack began last December with hiccough, followed by severe cough and spitting of blood; severe pain in left chest. Was then in Ward 3 for six weeks. Diagnosis, pneumonia.

Present Illness. Was out for two or three days and returned to Ward 6, where he was under treatment for about five weeks. Pleurisy of right side. Was tapped four times, a dark colored bloody fluid being removed. Was outside (since March 15th), being under treatment part of the time. Was tapped a week ago, and no fluid was found. Has coughed all along, but more of late. Has profuse expectorations of serous fluid with some small lumps of white muco-purulent matter. Constipation alternates with diarrhœa, the stools being very offensive. Pain and tenderness in epigastrium for past week. Pain in lower and right chest. Dyspnœa on exertion, or going up stairs ever since has been sick, but worse of late.

Examination. Some emaciation; tongue slightly coated. Chest. No difference in measurement of two sides. Vocal fremitus increased on right above, somewhat diminished below. Dullness on the right side, begins at the nipple in front and extends up almost to the spine of scapula when the patient sits up behind. Respiratory sounds can be heard, but are faint over area of dullness. Vocal fremitus also diminished. A friction sound is heard over anterior and lateral aspect of right chest, plainest near nipple. Relative dullness, broncho-vesicular breathing, râles, bronchophony over right apex. Respiratory sounds are exaggerated and some moist râles over entire left lung, most noticeable at apex. Heart's area of dullness is increased and merges below with area of dullness on right side noted above. Apex beat in the fifth intercostal space about an inch outside nipple; heart tones pure and can be heard distinctly over entire area of cardiac dullness to right border of sternum. Heart's action rapid and rather weak.

Abdomen. Hepatic area of flatness extends almost to umbilicus and to left chondral region. Spleen apparently not enlarged; ascites cannot be determined; abdomen is somewhat tense.

April 30th. Aspirated thirty ounces of turbid blood-stained fluid from left pleural cavity, one-eighth of which was pus.

May 19th. Area of flatness has returned to nearly former level. Patient sent to surgical side, but surgeons refused to operate, saying there was no pus which was discovered by a second tapping, when a quart of fluid, same as before, was withdrawn.

May 23d. Lower border of liver is about one inch above umbilicus; feels nodular, but no pain and tenderness there.

May 26th. Removed three and a half pints of a fluid, nearly purely pus, from the right pleural cavity.

May 27th. *Operation.* After washing and cleansing with bi-chloride, an incision was made in the infra-axillary space directly over the rib, a portion about one inch in length being resected. On opening the cavity pus flowed in abundance. The opening was closed with gauze sponges, and dressed antiseptically.

June 3d. Dressed daily, a drainage tube having been inserted.

June 8th. Condition very bad; stimulants ordered. Death.

Case xv. Martin S., single, white, age 32, laborer, American, admitted July 11, 1890.

Diagnosis. Empyema of the left pleural cavity.

Family History. Negative as far as known. Has had gonorrhœa once.

Previous Illness. "Bilious fever" eight years ago.

Present Illness. Began April 1st, with bad cold and bronchitis, and from which patient did not recover up to the present attack. About fifteen days ago began to cough again with pain in the right chest. Expectorates frothy mucus. Aspiration reveals pus.

Transferred to surgical side and has been operated on by rib resection. Still (August 1) in Hospital and doing well.

Case xvi. William J., single, white, printer, admitted February 12, 1890.

Diagnosis. Old empyema.

Family History. Parents both alive.

Past History. No venereal disease. Pneumonia, pleurisy, empyema, multiple abscess.

Habits. Moderate drinker. Smokes tobacco.

Present Illness. About three weeks ago noticed pain in hip, stomach and side. Bowels regular. Has some night sweats. Appetite good. Has just recovered from empyema for which he was treated in a New York hospital.

Physical Examination. Reveals dullness on percussion over L. R. L., the remaining part normal. On auscultation vesicular respiratory sound absent over lower right lobe. On inspection the right side of the chest is retracted at the lower part. There are marks of a former operation for empyema, also one posteriorly where an abscess has been opened. Palpation over lower right lobe gives diminished vocal resonance.

Discharged April 13th, recovered.

Case xvii. Thomas W., married, white, age 36, clerk, American; admitted July 14, 1889.

Diagnosis. Old empyema—sinuses.

History. Five years ago patient had an attack of pleurisy with effusion. Was aspirated a number of times. Three and a half years ago pus was discovered. Counter-openings were made

and drainage established. Four operations for resection of ribs have been made since, and he has been told that all have been resected except first and last. There has been a constant discharge.

Examination. Dressings contain rather a large amount of a very foul-smelling discharge. There is a scar-like depression capable of holding an ounce or two just anterior to the axilla. There is a sinus at the upper opening through which a probe can be passed upward for four inches. Sinus is quite narrow.

Treatment. Washed out with boracic acid solution and injected peroxide of hydrogen, leaving in a small tube.

July 17th. Operation consisted in making an incision from just above the anterior fold of axilla downward about 8 inches, with one or two lateral incisions to gain room, and cutting scar tissue away until the extremities of the anterior portions of the ribs left by former operations were revealed. These were then clipped off (six or seven) so that between one and two inches remained between the anterior and posterior fragments. Bubbles of air escaped from this opening, and the lung was visible. There seemed to be some good lung tissue near the apex. The incisions were partially closed and the cavity packed with bi-chloride gauze.

July 21st. Dressed. Considerable blood and discharge of bad odor soaked through old dressings. Cavity, after irrigation, looked clean, and holds perhaps four ounces; apparently there is an abscess forming on left forearm.

July 25th. Patient complains of daily chills.

September 30th. This patient has been dressed two or three times a week. Cavity is discharging less and is slowly contracting.

November 20th. Under ether the old sinus, which extended upward in the median line of the left side under the clavicle, was incised, the pectoralis muscle divided and the second rib which had been left intact was resected. Highest temperature reached in this case was 100.8°.

BAYARD HOLMES.

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