III. HYDROTHORAX.

Hydrothorax is a transudation of simple non-inflammatory fluid into the pleural cavities, and occurs as a secondary process in many affections. The fluid is clear, without any flocculi of fibrin, and the membranes are smooth. It is met with more particularly in connection with general dropsy, either renal, cardiac, or hæmic. It may, however, occur alone, or with only slight œdema of the feet. A child was admitted to the Montreal General Hospital with urgent dyspnœa and cyanosis, and died the night after admission. She had extensive bilateral hydrothorax, which had come on early in the nephritis of scarlet fever. In renal disease hydrothorax is almost always bilateral, but in heart affections one pleura is more commonly involved. The physical signs are those of pleural effusion, but the exudation is rarely excessive. In kidney and heart disease, even when there is no general dropsy, the occurrence of dyspnœa should at once direct attention to the pleura, since many patients are carried off by a rapid effusion. Post-mortem records show the frequency with which this condition is overlooked. The saline purges will in many cases rapidly reduce the effusion, but, if necessary, aspiration should repeatedly be practised.

IV. PNEUMOTHORAX (*Hydro-Pneumothorax and Pyo-Pneumothorax*).

Air alone in the pleural cavity, to which the term pneumothorax is strictly applicable, is an extremely rare condition. It is almost invariably associated with a serous fluid—hydro-pneumothorax, or with pus—pyo-pneumothorax.

Etiology.—It has usually been taught that there is an inherent tendency to pneumothorax, which is induced as soon as the pleura is opened. The experiments of S. West seem, however, to indicate the existence of a coherent force between the pleural surfaces much in excess of the elasticity of the lung, and sufficient in certain instances to maintain these organs in contact with the thoracic wall, even when there is free access to the pleura; so that in reality force is required to overcome the normal adhesion between the pleural membranes.

Pneumothorax arises: (1) In perforative wounds of the chest, in which case it is sometimes associated with extensive cutaneous emphysema. It has followed exploratory puncture with a hypodermic needle, as in two cases reported by Herman Biggs. Pneumothorax rarely follows fracture of the rib, even though the lung may be torn. (2) In perforation of the pleura through the diaphragm, usually by malignant disease of the stomach or colon. The pleura may also be perforated in cases of cancer of the œsophagus. (3) When the lung is perforated. This is by far the most common cause, and may occur: (*a*) In a normal lung from rupture of the air-vesicles during straining. Special attention has lately been called to this accident by S. West and De H. Hall. The air may be absorbed and no ill effect follows. It does not necessarily excite pleurisy, as pointed out many years ago by Gairdner, but inflammation and effusion are the usual result. (*b*) From perforation due to local disease of the lung, either the softening of a caseous focus or the breaking of a tuberculous cavity. According to S. West, ninety per cent of all the cases are due to this cause. Less common are the cases due to septic bronchopneumonia and to gangrene. A rare cause is the breaking of a hæmorrhagic infarct in chronic heart-disease, of which I met an instance a few years ago. (*c*) Perforation of the lung from the pleura, which arises in certain cases of empyema and produces a pleuro-bronchial fistula.

Pneumothorax occurs chiefly in adults, though cases are met with in very young children. It is more frequent in males than in females.

Morbid Anatomy.—If a trocar or blow-pipe is inserted between the ribs, there may be a jet of air of sufficient strength to blow out a lighted match. On opening the thorax the mediastinum and pericardium are seen to be pushed, or rather, as Douglas Powell pointed out, drawn over to the opposite side; but, as before mentioned, the heart is not rotated, and the relation of its parts is maintained much as in the normal condition. A serous or purulent fluid is usually present, and the membranes are inflamed. The cause of the pneumothorax can usually be found without difficulty. In the great majority of instances it is the perforation of a tuberculous cavity or a breaking of a superficial caseous focus. The orifice of rupture may be extremely small. In chronic cases there may be a fistula of considerable size communicating with the bronchi. The lung is usually compressed and carnified.

Symptoms.—The onset is usually sudden and characterized by severe pain in the side, urgent dyspnœa, and signs of general distress, as indicated by slight lividity and a very rapid and feeble pulse. There may, however, be no urgent symptoms, particularly in cases of long-standing phthisis. On more than one occasion I have found, post mortem, a pneumothorax which was unsuspected during life. West states that even in healthy adults this latent pneumothorax may occasionally occur.

The *physical signs* are very distinctive. *Inspection* shows marked enlargement of the affected side with immobility. The heart impulse is usually much displaced. On *palpation* the fremitus is greatly diminished or more commonly abolished. On *percussion* the resonance may be tympanitic or even have an amphoric quality. This, however, is not always the case. It may be a flat tympany, resembling Skoda's resonance. In some instances it may be a full, hyperresonant note, like emphysema; while in others—and this is very deceptive—there is dulness. These extreme variations depend doubtless upon the degree of intrapleural tension. On several occasions I have known an error in diagnosis to result from ignorance of the fact that, in certain instances, the percussion note

may be "muffled, toneless, almost dull" (Walshe). There is usually dulness at the base from effused fluid, which can readily be made to change the level by altering the position of the patient. Movable dulness can be obtained much more readily in pneumothorax than in a simple pleurisy. On *auscultation* the breath-sounds are suppressed. Sometimes there is only a distant feeble inspiratory murmur of marked amphoric quality. The contrast between the loud exaggerated breath-sounds on the normal side and the absence of the breath-sounds on the other is very snggestive. The râles have a peculiar metallic quality, and on coughing or deep inspiration there may be what Laennec termed the metallic tinkling. The voice, too, has a curious metallic echo. What is sometimes called the coin-sound, termed by Trousseau the *bruit d'airain*, is very characteristic. To obtain it the auscultator should place one ear on the back of the chest wall while the assistant taps one coin on another on the front of the chest. The metallic echoing sound which is produced in this way is one of the most constant and characteristic signs of pneumothorax. And, lastly, the Hippocratic succussion may be obtained when the auscultator's head is placed upon the patient's chest and his body shaken. A splashing sound is produced, which may be audible at a distance. A patient may himself notice it in making abrupt changes in posture. Of other symptoms displacement of organs is most constant. As already mentioned, the heart may be drawn over to the opposite side, and the liver greatly displaced, so that its upper surface is below the level of the costal margin, a degree of dislocation never seen in simple effusion.

The *diagnosis* of pneumothorax rarely offers any difficulty, as the signs are very characteristic. In cases in which the percussion note is dull the condition may be mistaken for effusion. I made this mistake in a case of pulsating pleurisy, in which the pneumothorax followed heavy lifting, and it was not until several days later, after some of the fluid had been withdrawn, that a tympanitic note developed. Diaphragmatic hernia following a crush or other accident may closely simulate pneumothorax.

In cases of very large phthisical cavities with tympanitic percussion resonance and râles of an amphoric, metallic quality the question of pneumothorax is sometimes raised. In those rare instances of total excavation of one lung the amphoric and metallic phenomena may be most intense, but the absence of dislocation of the organs and of the succussion splash and of the coin sound suffice to differentiate this condition. Why the coin sound is not heard it is difficult to determine, unless its production is connected in some way with a certain degree of air-tension, which is not present in a vomica, however large. The condition of pyopneumothorax subphrenicus may simulate closely true pneumothorax.

The *prognosis* in cases of pneumothorax depends largely upon the cause. The phthisical cases usually die within a few weeks. Pneumothorax developing in a healthy individual often ends in recovery. There are cases of phthisis in which the pneumothorax, if occurring early, seems

to arrest the progress of the tuberculosis. This appeared to be the case in a man with chronic pneumothorax who was under my care in Philadelphia for between three and four years. It may be a chronic condition, as in the case just mentioned, and a fair measure of health may be enjoyed.

Treatment.—Practically these cases should be dealt with as ordinary pleurisy with effusion. Of course, when pneumothorax develops in advanced phthisis the indication is to relieve the pain and distress either by morphia or chloroform; but in cases which develop early the fluid should be withdrawn by aspiration, or, if purulent, permanent drainage should be obtained. Even when the condition has seemed to be most desperate I have known recovery to take place after thorough drainage of the sac. Portions of ribs may have to be excised, and during convalescence it is well for the patient to practise expansion of the lung in the manner already mentioned. There are cases of pneumothorax in phthisis in which the general condition is so good and the inconvenience so slight that to let well enough alone seems the best course. In such an occasional aspiration may be performed if the fluid increases. In some of the instances the mere tapping of the chest with a fine needle, so as to allow the escape of some of the air, seems to give relief by reducing the intrathoracic pressure. Good results are stated to have followed the method introduced by Potain, of replacing the air and fluid within the thorax by sterilized air.

AFFECTIONS OF THE MEDIASTINUM.

(1) **Simple Lymphadenitis.**—In all inflammatory affections of the bronchi and of the lungs the groups of lymph glands in the mediastinum become swollen. In the bronchitis of measles, for example, and in simple broncho-pneumonia the bronchial glands are large and infiltrated, the tissue is engorged and œdematous, sometimes intensely hyperæmic. Much stress has been laid by some writers on this enlargement of the glands in the posterior mediastinum, and De Mussy held that it was an important factor in inducing paroxysms of whooping-cough. They may attain a size sufficient to induce dulness beneath the manubrium and in the upper part of the interscapular regions behind, though this is often difficult to determine. In reality the glands lie chiefly upon the spine, and unless those which are deep in the root of the lung are large enough to induce compression of the adjacent lung tissue, I doubt if the ordinary bronchial adenopathy ever can be determined by percussion in the upper interscapular region. I have never met with an instance in which the compression of either bronchus seemed to have resulted from the glands, however large. Tuberculous affection of these glands has already been considered.

(2) **Suppurative Lymphadenitis.**—Occasionally abscess in the bronchial or tracheal lymph glands is found. It may follow the simple adenitis, but

is most frequently associated with the presence of tubercle. The liquid portion may gradually become absorbed and the inspissated contents undergo calcification. Serious accident occasionally occurs, as perforation into the œsophagus or into a bronchus.

(3) **Tumors; Cancer and Sarcoma.**—In Hare's elaborate study of 520 cases of disease of the mediastinum* there were 134 cases of cancer, 98 cases of sarcoma, 21 cases of lymphoma, 7 cases of fibroma, 11 cases of dermoid cysts, 8 cases of hydatid cysts, and instances of lipoma, gumma, and enchondroma. From this we see that cancer is the most common form of growth. The tumor occurred in the anterior mediastinum alone in 48 of the cases of cancer and 33 of the cases of sarcoma. The disease may be either primary in the mediastinal tissues and lymph structures or secondary. Sarcoma is more frequently primary than cancer. Males are more frequently affected than females. The age of onset is most commonly between thirty and forty.

Symptoms.—The signs of mediastinal tumor are those of intrathoracic pressure. *Dyspnœa* is one of the earliest and most constant symptoms, and may be due either to pressure on the trachea or on the recurrent laryngeal nerves. It may indeed be cardiac, due to pressure upon the heart or its vessels. In a few cases it results from the pleural effusion which so frequently accompanies intrathoracic growths. Associated with the dyspnœa is a cough, often severe and paroxysmal in character, with the brazen quality of the so-called aneurismal cough when a recurrent nerve is involved. The voice may also be affected from a similar cause. Pressure on the vessels is common. The superior vena cava may be compressed and obliterated, and when the process goes on slowly the collateral circulation may be completely effected. Less commonly the inferior vena cava or one or other of the subclavian veins is compressed. The arteries are much less rarely obstructed. It is remarkable how little the aorta may be involved, though entirely surrounded by a sarcomatous or cancerous mass. There may be dysphagia, due to compression of the œsophagus. In rare instances there are pupillary changes, either dilatation or contraction, due to involvement of the sympathetic.

Physical Signs.—On inspection there may be orthopnœa and marked cyanosis of the upper part of the body. In such instances, if of long duration, there are signs of collateral circulation and the superficial mammary and epigastric veins are enlarged. In a patient with Hodgkin's disease, at present under observation and in whom during the past sixteen months there has been progressive compression and now obliteration of the superior vena cava, the entire subcutaneous tissue of the front of the thorax seems a plexus of veins and the epigastric vessels are as large as the index-finger. Such instances are, I think, more common in lymphadenoma than in sarcoma or cancer. In these cases of chronic obstruction

* Fothergillian Prize Essay of the Medical Society of London, Philadelphia, 1889.

the finger-tips may be clubbed. There may be bulging of the sternum or the tumor may erode the bone and form a prominent subcutaneous growth. The rapidly growing lymphoid tumors more commonly than others perforate the chest wall. In four of thirteen cases of Hodgkin's disease, of which I have notes, there was mediastinal growth, and in three instances the sternum was eroded and perforated. The perforation may be on one side of the breast-bone. The projecting tumor may pulsate like an aneurism; the heart may be dislocated and its impulse much out of place. Contraction of one side of the thorax has been noted in a few instances. On palpation the fremitus is absent wherever the tumor reaches the chest wall. If pulsating, it rarely has the forcible, heaving impulse of an aneurismal sac. On auscultation there is usually silence over the dull region. The heart-sounds are not transmitted and the respiratory murmur is feeble or inaudible, rarely bronchial. Vocal resonance is, as a rule, absent. Signs of pleural effusion occur in a great many instances of mediastinal growth, and if in any doubt the aspirator needle should be used.

The *diagnosis* of mediastinal tumor from aneurism is sometimes extremely difficult. An interesting case reported and figured by Sokolosski, in Bd. 19 of the Deutsches Archiv für klinische Medicin, in which Oppolzer diagnosed aneurism and Skoda mediastinal tumor, illustrates how in some instances the most skilful of observers may be unable to agree. Scarcely a sign is found in aneurism which may not be duplicated in mediastinal tumor. This is not strange, since the symptoms in both are largely due to pressure. The time element is important. If a case has persisted for more than eighteen months the disease is probably aneurism. There are, however, exceptions to this. In the case of compression of the vena cava mentioned above, the disease has lasted for more than two years and the patient has improved so markedly under the use of arsenic that had he no other lymphatic enlargements the diagnosis might be uncertain. By far the most valuable sign of aneurism is the diastolic shock so often to be felt, and in a majority of cases to be heard, over the sac. This is rarely, if ever, present in mediastinal growths, even when they perforate the sternum and have communicated pulsation. Another point of importance is that in a tumor, advancing from the mediastinum, eroding the sternum and appearing externally, if aneurismal, has forcible, heaving, and distinctly expansile pulsations. The radiating pain in the back and arms and neck is rather in favor of aneurism, as is also a beneficial influence on it of iodide of potassium.

The frequency of pleural effusion in connection with mediastinal tumor is to be constantly borne in mind. It may give curiously complex characters to the physical signs—characters which are profoundly modified after aspiration of the liquid.

(4) **Abscess of the Mediastinum.**—Hare collected 115 cases of mediastinal abscess, in 77 of which there were details sufficient to permit the analysis. Of these cases the great majority occurred in males. Forty-four

were instances of acute abscess. The anterior mediastinum is most commonly the seat of the suppuration. The cases are most frequently associated with trauma. Some have followed erysipelas or occurred in association with eruptive fevers. Many cases, particularly the chronic abscesses, are of tuberculous origin. Of *symptoms*, pain behind the sternum is the most common. It may be of a throbbing character, and in the acute cases is associated with fever, sometimes with chills and sweats. If the abscess is large there may be dyspnœa. The pus may burrow into the abdomen, perforate through an intercostal space, or it may erode the sternum. Instances are on record in which the abscess has discharged into the trachea or œsophagus. In many cases, particularly of chronic abscess, the pus becomes inspissated and produces no ill effect. The *physical signs* may be very indefinite. A pulsating and fluctuating tumor may appear at the border of the sternum or at the sternal notch. The absence of *bruit*, of the diastolic shock, and of the expansile pulsation usually enables a correct diagnosis to be made. When in doubt a fine hypodermic needle may be inserted.

(5) **Miscellaneous Affections.**—In Hare's monograph there were 7 instances of fibroma, 11 cases of dermoid cysts, 8 cases of hydatid cysts, and cases of lipoma and gummata.

The *thymus gland* may be enlarged and produce the physical signs of mediastinal tumor. In children there are instances of spasm of the glottis, which is believed by some to depend upon enlargement of the thymus. Jacobi,* in his monograph, says that some instances of sudden death and also so-called thymic asthma may occasionally be referred to this cause. Malignant tumors of the thymus may attain considerable size and produce signs of tumor. In rare cases mediastinal growths develop from the *thyroid gland*. These may be substernal in position and directly connected with the gland. Kretschy has reported a sarcoma of the thyroid four and three quarter inches in length, which forms a mediastinal tumor passing to the level of the ninth dorsal vertebra. I have reported a somewhat similar instance, which developed in the left lobe of the thyroid and formed an elongated mass which passed down beside the trachea to the bifurcation.

(6) **Emphysema of the Mediastinum.**—Air in the cellular tissues of the mediastinum is met with in cases of trauma and occasionally in fatal cases of diphtheria and in whooping-cough. Champneys has called attention to its frequency in trachëotomy, in which he says the conditions favoring the production are division of the deep fascia, obstruction to the air-passages, and inspiratory efforts. The deep fascia, he says, should not be raised from the trachea. It is often associated with pneumothorax. The condition seems by no means uncommon. Angel Money found it in 16 of 28 cases of tracheotomy, and in two of these pneumothorax also was present.

* Transactions of the Association of American Physicians, vol. iii.

SECTION V.

DISEASES OF THE CIRCULATORY SYSTEM.

I. DISEASES OF THE PERICARDIUM.

I. PERICARDITIS.

Pericarditis is the result of infective processes, primary or secondary, or arises by extension of inflammation from contiguous organs.

Etiology.—*Primary*, so-called idiopathic, inflammation of this membrane is rare; but cases are met with, most commonly in children, in which there is no evidence of rheumatism or other conditions with which the disease is usually associated.

Pericarditis from injury usually comes under the care of the surgeon in connection with the primary wound. Interesting cases are those in which the traumatism is from within, due to the passage of some foreign body—such as a needle, a pin, or a bone—through the œsophagus into the pericardium.

As a *secondary* process pericarditis is met with in the following affections: (*a*) A majority of the cases occur in connection with rheumatism. The percentage given by different authors ranges from thirty to seventy. The articular trouble may be slight or, indeed, the disease may be associated with acute tonsillitis of rheumatic subjects. Cases are recorded in which the pericarditis has preceded the articular disease. (*b*) Septic processes rank next to rheumatism. In the acute necrosis of bone and puerperal fever it is not uncommon. (*c*) Tuberculosis, in which the disease may be primary or part of a general involvement of the serous sacs or associated with extensive pulmonary disease. (*d*) Eruptive fevers. In children, the disease is not infrequent after scarlatina. It is rarely met with in measles, small-pox, or typhoid fever. In other infective diseases, such as diphtheria and pneumonia, it is rare. (*e*) Dyscrasias. Certain altered conditions of the system seem to render the pericardium more susceptible to inflammation. Of these gout takes the first place. In chronic Bright's disease pericarditis is by no means rare. The *pericardite brightique* of the French forms one of the most important groups of the disease in persons over fifty years of age, most frequently accom-