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-

panying the chronic interstitial form. Pericarditis has been met with also in scurvy and diabetes.

Pericarditis by extension of disease from contiguous organs. In pleuro-pneumonia it forms one of the most serious complications, and was present in 5 cases in 100 post-mortems in this disease which I made at the Montreal General Hospital. It is most often met with in the pleuro-pneumonia of children and of alcoholics. The association with simple pleurisy is much less common. In ulcerative endocarditis, purulent myocarditis, and in aneurism of the aorta pericarditis is occasionally found. It may also result from extension of disease from the bronchial glands, the ribs, sternum, vertebræ, and even from the abdominal viscera.

Pericarditis occurs at all ages. Cases are reported in the fœtus. In the new-born it may result from septic infection through the navel. Throughout childhood the incidence of rheumatism and scarlet fever makes it a frequent affection, whereas late in life it is most often associated with Bright's disease and gout. Males are somewhat more frequently attacked than females. Climatic and seasonal influences have been mentioned by some writers. The so-called epidemics of pericarditis have been outbreaks of pneumonia with this as a frequent complication.

Anatomically as well as clinically the disease may be considered under the following divisions:

1. Acute, plastic, or dry pericarditis.
2. Pericarditis with effusion—sero-fibrinous, hæmorrhagic, or purulent.
3. Chronic adhesive pericarditis (adherent pericardium).

Acute Plastic Pericarditis.—This, the most common form, occurs usually as a secondary process, and is distinguished by the small amount of fluid exudation, which does not, as in the next variety, give special characters to the disease. It is a benign form and rarely, if ever, of itself proves fatal.

Anatomically it may be partial or general. In the mildest grades the serous membrane looks lustreless and roughened. This is due to the presence of a thin fibrinous sheeting, which can be lifted with the knife, showing the membrane beneath to be injected or in places ecchymotic. As the fibrinous sheeting increases in thickness the constant movement of the adjacent surfaces gives to it sometimes a ridge-like, at others a honeycombed appearance. With more abundant fibrinous exudation the membranes present an appearance resembling buttered surfaces which have been drawn apart. The fibrin is in long shreds, and the heart presents a curiously shaggy appearance—the so-called hairy heart of old writers—*cor villosum*.

In mild grades the subjacent muscle looks normal; but in the more prolonged and severe cases there is myocarditis, and for 2 or 3 mm. beneath the visceral layer the muscle presents a pale, turbid appearance.

Many of these acute cases are tuberculous; covered by the layers of lymph the granulations are easily overlooked in a superficial examination.

Slight fluid exudation is invariably present, entangled in the meshes of fibrin, but there may be very thick fibrinous layers without much serous effusion.

Symptoms.—The majority of cases of simple plastic pericarditis, like simple endocarditis, present no symptoms, and unless sought for there are no objective signs indicating its existence. In the post-mortem room it is not uncommon to find it in cases in which its presence has been unsuspected during life.

Pain is a variable symptom, not usually intense, and in this form rarely excited by pressure. It is more marked in the early stage, and may be referred either to the præcordia or to the region of the xiphoid cartilage. Instances are recorded of pain of an aggravated and most distressing character resembling angina. Fever is usually present, but it is not always easy to say how much depends upon the primary febrile affection, and how much upon the pericarditis. It is as a rule not high, rarely exceeding 102·5°. In rheumatic cases hyperpyrexia has been observed.

Physical Signs.—*Inspection* is negative; *palpation* may reveal the presence of a distinct fremitus caused by the rubbing of the roughened pericardial surfaces. This is usually best marked over the right ventricle. It is not always to be felt, even when the friction sound on auscultation is loud and clear. *Auscultation:* The friction sound, due to the movement of the pericardial surfaces upon each other, is one of the most distinctive of physical signs. It is double, corresponding to the systole and diastole; but the synchronism with the heart-sounds is not accurate, and the to-and-fro murmur usually outlasts the time occupied by the first and second sound. In rare instances the friction is single; more frequently it appears to be triple in character—a sort of canter rhythm. The sounds have a peculiar rubbing, grating quality, characteristic when once recognized, and rarely simulated by endocardial murmurs. Sometimes instead of grating there is a creaking quality—the *bruit de cuir neuf*—the new-leather murmur of the French. The pericardial friction appears superficial, very close to the ear, and is usually intensified by pressure with the stethoscope. It is best heard over the right ventricle, the part of the heart which is most closely in contact with the front of the chest—that is, in the fourth and fifth interspaces and adjacent portions of the sternum. There are instances in which the friction is most marked at the base over the aorta and at the superior reflection of the pericardium. Occasionally it is best heard at the apex. It may be limited and heard over a very narrow area, or it may be transmitted up and down the sternum. There are, however, no definite lines of transmission as in the endocardial murmur. An important point is the variability of sounds, both in position and quality; they may be heard at one visit and not at another. The maximum of intensity will be found to vary with position.

Diagnosis.—There is rarely any difficulty in determining the presence of a dry pericarditis, for the friction sounds are distinctive. The double murmur of aortic incompetency may simulate closely the to-and-fro pericardial rub. I recall one instance at least in which this mistake was made. The constant character of the aortic murmur, the direction of transmission, the phenomena in the arteries, and the associated conditions of the disease should be sufficient to prevent this error.

I have never known an instance in which pericarditis was mistaken for endocarditis, though writers refer to such, and give the differential diagnosis in the two affections. The only possible mistake could be made in those rare instances of single soft, systolic, pericardial friction.

Pleuro-pericardial friction is very common, and may be associated with endo-pericarditis, particularly in cases of pleuro-pneumonia. It is frequent, too, in phthisis. It is best heard over the left border of the heart, and is much affected by the respiratory movement. Holding the breath or taking a deep inspiration may annihilate it. The rhythm is not the simple to-and-fro diastolic and systolic, but the respiratory rhythm is superadded, usually intensifying the murmur during expiration and lessening it on inspiration. In phthisis there are instances in which, with the friction, a loud systolic click is heard, due to the compression of a thin layer of lung and the expulsion of a bubble of air from a small softening focus or from a bronchus.

Course and Termination.—Simple fibrinous pericarditis never kills, but it occurs so often in connection with serious affections that we have frequent opportunities to see all stages of its progress. In the majority of cases the inflammation subsides and the thin fibrinous laminæ gradually become converted into connective tissue, which unites the pericardial leaves firmly together. In other instances the inflammation progresses, with increase of the exudation, and the condition is changed from a "dry" to a "moist" pericarditis, or the pericarditis with effusion.

In a few instances—probably always tuberculous—the simple plastic pericarditis becomes chronic, and great thickening of both visceral and parietal layers is gradually induced.

Pericarditis with Effusion.—Though commonly a direct sequence of the dry or plastic pericarditis, of which it is sometimes spoken as the second stage, this form presents special features and deserves separate consideration. It is found most frequently in association with acute rheumatism, tuberculosis, and septicæmia, and sets in usually with the symptoms above described, namely, præcordial pain, with slight fever or a distinct chill.

In children the disease may, like pleurisy, come on without local symptoms, and, after a week or two of failing health, slight fever, shortness of breath, and increasing pallor, the physician may find, to his astonishment, signs of most extensive pericardial effusion. These latent cases are often tuberculous. The effusion may be sero-fibrinous, hæmorrhagic, or purulent. The amount varies from 200 or 300 c. c. to 2 litres. In the cases of sero-fibrinous exudation the pericardial membranes are covered with thick, creamy fibrin, which may be in ridges or honeycombed, or may present long, villous extensions. The parietal layer may be several millimetres in thickness and may form a firm, leathery membrane. The hæmorrhagic exudation is usually associated with tuberculous, or with cancerous pericarditis, or with the disease in the aged. The lymph is less abundant, but both surfaces are injected and often show numerous hæmorrhages. Thick, curdy masses of lymph are usually found in the dependent part of the sac. In the purulent effusion the fluid has a creamy consistency, particularly in tuberculosis. In many cases the effusion is really sero-purulent, a thin, turbid exudation containing flocculi of fibrin.

The pericardial layers are greatly thickened and covered with fibrin. When the fluid is pus, they present a grayish, rough, granular surface. Sometimes there are distinct erosions on the visceral membrane. The heart muscle in these cases becomes involved to a greater or less extent, and on section, the tissue, for a distance of from two to three millimetres, is pale and turbid, and shows evidence of fatty and granular change. Endocarditis coexists frequently, but rarely results from the extension of the inflammation through the wall of the heart.

Symptoms.—Even with copious effusion the onset and course may be so insidious that no suspicion of the true nature of the disease is aroused.

As in the simple pericarditis, pain may be present, either sharp and stabbing or as a sense of distress and discomfort in the cardiac region. It is more frequent with effusion than in the plastic form. Pressure at the lower end of the sternum usually aggravates it. Dyspnœa is a common and important symptom, one which, perhaps, more than any other, excites suspicion of grave disorder and leads to careful examination of heart and lungs. The patient is restless, lies upon the left side or, as the effusion increases, sits up in bed. Associated with the dyspnœa is in many cases a peculiarly dusky, anxious countenance. The pulse is rapid, small, sometimes regular, and may present the characters known as *pulsus paradoxus*, in which during each inspiration the pulse-beat becomes very weak or is lost. These symptoms are due, in great part, to the direct mechanical effect of the fluid within the pericardium which embarrasses the heart's action. Other pressure effects are distention of the veins of the neck, dysphagia, which may be a marked symptom, and irritative cough from compression of the trachea. Aphonia is not uncommon, due to compression or irritation of the recurrent laryngeal as it winds round the aorta. Another important pressure effect is exercised upon the left lung. In massive effusion the pericardial sac occupies such a large portion of the antero-lateral region of the left side that the condition has frequently been mistaken for pleurisy. Even in moderate grades the left

lung is somewhat compressed. This is an additional element in the production of the dyspnœa.

Great restlessness, insomnia, and in the later stages low delirium and coma are symptoms in the more severe cases. Delirium and marked cerebral symptoms are associated with the hyperpyrexia of rheumatic cases, but apart from the ordinary delirium there may be poculiar mental symptoms. The patient may become melancholic and show suicidal tendencies. In other cases the condition resembles closely delirium tremens. Sibson, who has specially described this condition, states that the majority of such cases recover. Chorea may also occur, as was pointed out by Bright. Epilepsy is a rare complication which has occurred, as in pleurisy, during paracentesis.

Physical Signs.—*Inspection.*—In children the præcordia bulges and with copious exudation the antero-lateral region of the left chest becomes enlarged. The intercostal spaces are prominent and there may be marked œdema of the wall. Perforation externally through a space is very rare. Owing to the compression of the lung, the expansion of the left side is greatly diminished. The diaphragm and left lobe of the liver may be pushed down and may produce a distinct prominence in the epigastric region.

Palpation.—A gradual diminution and final obliteration of the cardiac shock is a striking feature in progressive effusion. The apex beat is often raised an interspace and dislocated outward. Alteration in the position of the impulse simultaneously with the position of the patient, a sign upon which Oppolzer laid great stress, cannot often be determined, as the beat may, and usually does, disappear entirely. The pericardial friction may lessen with the effusion, though it often persists at the base when no longer palpable over the right ventricle, or may be felt in the erect and not in the recumbent posture. Fluctuation can rarely, if ever, be detected.

Percussion gives most important indications. The gradual distention of the pericardial sac pushes aside the margins of the lungs so that a large area comes in contact with the chest wall and gives a greatly increased percussion dulness. The form of this dulness is irregularly pear-shaped; the base or broad surface directed downward and the stem or apex directed upward toward the manubrium.

Auscultation.—The friction sound heard in the early stages may disappear when the effusion is copious, but often persists at the base or at the limited area of the apex. It may be audible in the erect and not in the recumbent posture. With the absorption of the fluid the friction returns. One of the most important signs is the gradual weakening of the heart-sounds, which with the increase in the effusion may become so muffled and indistinct as to be scarcely audible. The heart's action is usually increased and the rhythm disturbed. Occasionally a systolic endocardial murmur is heard.

Important accessory signs in large effusion are due to pressure on the left lung. The antero-lateral margin of the lower lobe is pushed aside and in some instances compressed, so that percussion in the axillary region, in and just below the transverse nipple line, gives a modified percussion note, usually a flat tympany. Variations in the position of the patient may change materially this modified percussion area, over which on auscultation there is either feeble or tubular breathing.

Course.—Cases vary extremely in the rapidity with which the effusion takes place. In every instance, when a pericardial friction murmur has been detected, the practitioner should immediately outline with care—using the aniline pencil or nitrate of silver—the upper and left limits of cardiac dulness, since he will in this way have certain positive guides in determining the rate and grade of the effusion. In many instances the exudation is slight in amount, reaches a maximum within forty-eight hours, and then gradually subsides. In other instances the accumulation is more gradual and progressive, increasing for several weeks. To such cases the term chronic has been applied. The rapidity with which a sero-fibrinous effusion may be absorbed is surprising. The possibility of the absorption of purulent exudate is shown by the cases in which the pericardium contains semi-solid grayish masses in all stages of calcification. With sero-fibrinous effusion, if moderate in amount, recovery is the rule, with inevitable union, however, of the pericardial layers. In some of the septic cases there is a rapid formation of pus and a fatal result may follow in three or four days. More commonly, when death occurs with large effusion, it is not until the second or third week and takes place by gradual asthenia.

Prognosis.—In the sero-fibrinous effusions the outlook is good, and a large majority of all the rheumatic cases recover. The purulent effusions are, of course, more dangerous; the septic cases are usually fatal, and recovery is rare in the slow, insidious tuberculous forms.

Diagnosis.—Probably no serious disease is so frequently overlooked by the practitioner. Post-mortem experience shows how often pericarditis is not recognized, or goes on to resolution and adhesion without attracting notice. In a case of rheumatism, watched from the outset, with the attention directed daily to the heart, it is one of the simplest of diseases to diagnose; but when one is called to a case for the first time and finds perhaps an increased area of precordial dulness, it is often very hard to determine with certainty whether or not effusion is present.

The difficulty usually lies in distinguishing between dilatation of the heart and pericardial effusion. Although the differential signs are simple enough on paper, it is notoriously difficult in certain cases, particularly in stout persons, to say which of the conditions exists. The points which deserve attention are:

(*a*) The character of impulse, which in dilatation, particularly in thin-chested people, is commonly visible and wavy.