diminished in its intensity as the stethoscope is carried down the left edge of the sternum, where the feeble diastolic murmur may now be heard. If the incompetence be greater than the stenosis no systolic murmur may be heard in the aortic area, but the diastolic may be heard and propagated loudly down the left edge of the sternum and to the ensiform cartilage. It is also heard in the carotid artery, along with a systolic, on pressure being made upon it with the stethoscope —if the incompetence be great (Fig. 7). It is well to note that the absence of the second sound does not indicate that the valves are entirely gone, but simply that there may be diminished elasticity, and hence no accentuated sound. The secondary effects in the later stages, when the mitral valve becomes incompetent, have already been described.

Pulmonary stenosis and incompetence are extremely rare, and then generally congenital. If murmurs exist, they are best heard in the pulmonary area, and if a diastolic murmur be present it may be propagated, like the aortic diastolic, down the left edge of the sternum, but it would be accompanied by signs of dilatation of the right ventricle, with tricuspid incompetence, &c.—the signs of aortic disease being absent.

Method of Auscultation of the Valves.*—Place the stethoscope on the mitral area, and concentrate the attention upon the *first* sound of the heart, with a finger upon the carotid artery if necessary.

(1) Is there a murmur *immediately* preceding the first sound? If so, it is presystolic, and it may originate at the mitral or tricuspid valve. Compare the mitral and tricuspid areas for the maximum intensity. (Mitral or tricuspid stenosis, the latter being extremely rare.)

(2) Is there a murmur synchronous with or replacing the first sound? If so, it is systolic, and it may be produced at any of the four valves. (Mitral or tricuspid regurgitation; aortic or pulmonary stenosis, the latter being very rare.)

(3) Examine, in rotation, the left auricular area, and the tricuspid, aortic, and pulmonary areas to find the position of maximum intensity, and trace the direction of propagation of the murmur or murmurs.

A. Mitral systolic murmurs are heard best at the mitral area (sometimes also at the left auricular area), and are propagated from the apex round towards the left axillary line.

B. Tricuspid systolic murmurs are heard loudest in the tricuspid area, and are propagated over the liver. Compare A with B.

C. Aortic systolic murmurs are heard at the aortic area, and are propagated by the carotid artery. They diminish in intensity as

* This method only relates to the systematic examination of the murmurs, and the result of the examination should be considered along with the signs and symptoms already described. Murmurs are not invariably propagated in the lines of the blood current. They are due to the vibrations in the surrounding structures, and, therefore, they may sometimes vary in pitch and intensity, and yet have a common origin. Aortic regurgitant murmurs are often best heard in cardiac areas other than those usually stated.

the stethoscope is carried from the aortic area, inch by inch, down the left edge of the sternum, curving towards the apex of the heart, where the diminishing aortic systolic murmur may be found, by the pitch and character of the sound, to be the same originally heard at the mitral area. If not, compare C with A, as both may be present. Also, while carrying the stethoscope down the sternum, if the attention be transferred to the *second* sound for a moment, a feeble diastolic murmur may be heard, as *some* incompetence almost invariably exists with the stenosis.

D. Pulmonary systolic murmurs, seldom due to valvular disease, are best heard in the pulmonary area, and are not propagated in any definite direction.

(4) Place the stethoscope on the second right costal cartilage at its junction with the sternum, and carry it down, inch by inch, the left edge of the sternum, concentrating the attention now upon the *second* sound. Is there a murmur synchronous with or replacing the second sound? If so, it is diastolic, and it may originate at the aortic or pulmonary valve. (Aortic or pulmonary incompetence, the latter being very rare.)

A. Aortic diastolic murmurs may not be heard in the aortic area, but lower down the sternum and at the apex of the heart. If the incompetence be great, they are heard in the carotids by pressure being made upon the artery with the stethoscope, and then accompanied by a systolic. The "see-saw" murmur (aortic stenosis and incompetence) is often heard at the aortic area.

B. Pulmonary diastolic murmurs should be heard best in the pulmonary area and over the right ventricle. Compare the pulmonary and aortic areas; and note any accentuation or reduplication of the second sound.

(5) Place the stethoscope again upon the mitral area, but concentrate the attention upon the interval between the second sound and the first—*i.e.*, the diastole of the heart. Is there a murmur, not with or obscuring the second sound, but following it, and not *immediately* preceding the first sound? If so, it is the "mitral diastolic" murmur. It may be louder in the left auricular area, and it may occur along with, or run up to, a presystolic murmur, as it is most common in mitral stenosis. Compare it with the aortic and pulmonary areas, and note the absence of other signs of aortic disease.

Diagnosis.—The valvular diseases having already been placed before the reader in synoptical form, it is unnecessary to repeat the symptoms with the object of further contrasting them. The relations of murmurs to the respiratory movements (cardio-pulmonary murmur) should be noted; and extra cardiac causes may sometimes be differentiated by pressure, and by changing the position of the patient during auscultation.

The student is apt to consider the presence of a murmur *alone*, as pathognomonic of valvular disease, and to take its loudness as indicative of its seriousness; but this is not so, and the *presystolic* murmur is the only one which alone is a certain sign of valvular disease (mitral stenosis), but even it is *sometimes* simulated by an

aortic regurgitant murmur, and *vice versâ*. Alteration in the size of the heart, as revealed by palpation and percussion, is just as important an indication as the presence of murmurs; and in such examination due consideration must be given to the state of the surrounding organs, as dilated stomach, inflated lungs, enlarged liver, &c. The history of the case, antecedent illness—especially of acute rheumatism—together with the symptoms and physical signs, all require to be carefully considered.

A question which should always be kept prominently in view, is whether the disease is *organic* or *functional*. The diagnosis of valvular disease is sometimes very easy, but when the symptoms of heart failure are present, and the physical signs, including murmurs, have all been made out, it has often still to be decided whether the disease is valvular in origin or due to simple anæmia or dilatation, the result of relaxation and debility. Dyspnœa, pallor, dropsy, &c., are symptoms common to these affections; and there may be a combination of these present. The diagnosis is then difficult, and a very cautious opinion should be given; for although all or many of the signs of grave disease of the heart seem to be present, proper treatment may result in a complete cure, should the disease prove to be simple dilatation or anæmia. In connection with the latter disease, hæmic murmurs are generally systolic, and they are often heard loudest in the left auricular area. They are not propagated like the murmurs of valvular origin, and the age, sex, and history may help one to an accurate diagnosis. In simple dilatation, the flapping character of the first sound, and the history of the case with the presence of a *cause*, are the most important indications. It should be remembered that murmurs vary in intensity, and that they sometimes vanish altogether, especially those originating at the mitral valve. A basic systolic murmur is sometimes produced by excited action of the heart under medical examination, and it is probably due to a narrow aorta. In phthisical consolidations, the pulmonary artery, or subclavian, may be involved, and murmurs may be heard over these vessels—the subclavian murmur being sometimes present in the healthy. Pulmonary murmurs in phthisical patients may also be due to the congenital alterations sometimes present in these cases.

With regard to exocardial murmurs they are more superficial, and they are not associated with any valve nor propagated in any definite direction, like the endocardial murmurs. It is better to first consider all murmurs endocardial, and then exclude them.

Prominence of the chest wall may be due to enlargement of the heart, aneurism, or tumours. Increased dulness upon percussion over the precordial region may be due to these causes, and also to dilatation of the heart; or diseases in which there is retraction of the lung may leave more of the heart uncovered (see *Aneurism and Mediastinal Tumours*, p. 47).

The **prognosis** in all the chronic valvular lesions is grave, as regards both the health and duration of life. It must be estimated in relation to the circumstances of the patient, the nature of the lesion, the signs and symptoms to which the lesion gives rise, and to the effects of muscular effort, and treatment.

The regurgitant diseases are more serious than the obstructive, the order of importance being as follows, viz.:—Aortic incompetence, very grave, as sudden death may take place from dilatation of the ventricle; mitral regurgitation, less grave, but death may also take place suddenly, although it is far more usual by the slow development of the secondary effects leading to dropsy, &c.; mitral stenosis comes next; and aortic obstruction is the least important. When unfavourable symptoms manifest themselves in aortic incompetence, the danger is great, and the end may take place—if not suddenly—in about three months (Balfour). In mitral regurgitation, as the attacks become more frequent, and the symptoms and signs disappear more slowly under treatment, the prognosis becomes more and more serious, and death may take place from failure of the heart or from a secondary complication. The loudness of a murmur is no test of the extent of a valvular disease; but a "see-saw" murmur at the aortic area, in which the diastolic is louder than the systolic, is more serious than the reverse. A fall in the intensity of a murmur is a bad sign. A quickened pulse in aortic regurgitation is unfavourable. It is far more important to consider the prognosis in relation to the probable state of the *fibres* of the heart, as revealed by the persistency of the physical signs and symptoms, and the presence of secondary complications.

The **treatment** of the chronic valvular diseases. When the lesion is "mute" no direct treatment, and certainly no digitalis, is required. Beyond advising the patient to throw no stress upon the heart by climbing or running, &c., to avoid excitement, and to take all the rest that he can, no treatment is necessary. In the early stages, or in sudden failure of the heart, rest and blue pill, followed by saline purgatives, are indicated. When the heart begins to dilate, or the compensation to fail, then digitalis is required. To avoid repetition a short synopsis of the physiological action and uses of digitalis is here given.

Digitalis has (1) a direct action on the heart muscle, (2) it stimulates the cardio-inhibitory fibres of the vagus and thus holds the heart in check, and (3) it stimulates the vaso-motor centre and thus raises the arterial tension. The direct action upon the heart may be *tonic*, or it may be that the coronary arteries are better filled and the heart thus better nourished, by the increased tension in the smaller vessels. The stimulation of the vagus renders the beats of the heart *slower*, and stimulation of the vaso-motor centre by increasing the tension, induces the heart to act more *forcibly* to overcome the increased resistance. When digitalis is long continued, the pneumogastric may lose its control and the heart may become rapid and feeble. The appetite and stomach may become disordered. Patients under the full influence of the drug should be kept *at rest*, as exertion may produce syncope and other alarming symptoms. A high temperature seems to lessen the power of digitalis over the cardio-inhibitory centre, and in these cases its action should be

carefully watched. It is not considered to be a true "cumulative" poison, but after prolonged use, if their should be defective elimination, alarming symptoms may suddenly occur. Digitalis is an indirect diuretic. It should not be used in chronic Bright's disease.

Digitalis is used in palpitation with irregular action of the heart, whether due to valvular disease or not. Intermittence of the pulse is always an indication for the use of degitalis, but it must never be used when fatty degeneration of the heart fibres is suspected. It is indicated in dilatation of the heart. In mitral stenosis, by the prolongation of the diastole, it allows time for the better filling of the ventricle through the stenosed valve. In mitral regurgitation, with feeble and irregular action of the heart, the lungs becoming engorged and lividity with dropsy setting in, it is most strongly indicated. The increased tension in the blood-vessels produced by digitalis lessens the transudation and promotes the absorption of the serum in dropsical cases. In aortic stenosis it should only be used in the later stages when the heart is dilated and feeble; but when hypertrophy exists, or the vascular system is atheromatous, it may be dangerous. In aortic regurgitation it is of great value when the compensatory hypertrophy begins to fail. It is also used in bronchitis with a dilated heart. Digitalis has also some other uses, but these need not be considered here in relation to the valvular diseases and their effects. The doses of digitalis are five to ten, and even thirty minims sometimes, of the tincture; two to four fluid drachms (or more) of the infusion; one-fiftieth to one-twentieth of a grain of digitalinum, hypodermically. Bartholow states that the English or German wild plant of the second year's growth is the most active digitalis. In the administration of digitalis the position of the apex beat, the area of cardiac dulness, the state of the pulse, and the volume of the urine should be carefully noted. If the latter is not maintained or increased the drug should be discontinued. In senile conditions of the heart, it is recommended by Dr. Balfour that digitalis be given along with an *arterial relaxant*, as iodide of potassium or sodium, or a nitrite.

The patient while under digitalis treatment should be kept in the recumbent position if taking full doses—rest being a very important factor in the treatment of heart disease. It is advisable to suspend the use of digitalis occasionally for a day or two. The tincture of strophanthus has lately acquired a reputation in the treatment of heart disease. It differs in one respect, at least, from digitalis, in not raising the tension within the blood-vessels. The dose is three to ten minims thrice daily. *Tonics* may be given, as strychnine, or arsenic and iron (℞ 1), quinine and mineral acids (as ℞ 2), Easton's syrup, &c., when the patient is fairly well and able to take moderate exercise. Tonics may be given early with the digitalis—either separately or together, in the form of a pill (as ℞ 3).

The diet should be at all times nutritious and easily digestible, care being taken not to overload the stomach. Small doses of whisky may be necessary; but strong tea, coffee, and tobacco are to be avoided.

The treatment of secondary congestion, œdema, and infarctions of the lung with pneumonia, bronchitis, &c., is described in diseases of the respiratory system. Frequently in these cases the digitalis is prescribed with carbonate of ammonia and other expectorants, as senega and squills (℞ 4). Poultices or turpentine stupes are also necessary; and wet or dry cupping of the chest is sometimes practised to relieve the symptoms. Digitalis poultices (with linseed) may be used for precordial pain. Hæmoptysis may be treated by turpentine in capsules, ergot, or by strong doses of acids and morphia. Rest, ice to suck, and poultices on the chest to relieve the internal congestion will generally suffice. Congestion of the stomach and liver are best treated with occasional doses of podophyllin, or by iridin, euonymin, or bluepill, followed in a few hours by a saline purge. Pepsin with a mineral acid may be necessary for the stomach—with attention to the diet. The kidneys may be occasionally flushed with draughts of cream of tartar in water—a drachm or more for a dose—in those cases where there is a tendency to œdema; but if the dropsy be great in quantity, the compound powder of jalap, forty grains or more, and combined with a sixteenth to a half grain of elaterium if necessary, should be used regularly twice or thrice a week. The dropsy may also be treated by occasional vapour baths and by the use of diaphoretics. When the legs and scrotum become extremely tense it may be necessary to puncture them to relieve the pain, but to do this with a sharp tenotomy knife is much less likely to produce erysipelas than by using Southey's tubes. *Paracentesis abdominis* may be performed when the ascitic fluid embarrasses the breathing of the patient; or when existing in large quantity, it hinders the process of absorption. A pill containing digitalis, mercury, and squills (℞ 5) is useful in heart disease with dropsy. Diuretin—fifteen to thirty grains thrice daily—has proved to be a useful drug, and a powerful diuretic in dropsical conditions. Pain and severe dyspnœa are best treated by the hypodermic injection of morphia—one-twelfth to one-fourth of a grain. This may also be used for sleeplessness, but chloralamide, paraldehyde, or chloral may first be tried. The inhalation of nitrite of amyl or chloroform may be necessary in the severe forms of angina pectoris. Erythrol tetra-nitrate is recommended by Bradbury and Marshall. Arsenic should be given in the chronic forms. A mixture of ether and morphia (℞ 6) is useful to relieve breathlessness. Convulsions should be treated by bromides and rest. Rheumatic and anæmic cases require salicylates and iron. In young suitable cases of heart disease moderate gymnastic exercises and bathing are of benefit.

Dilatation, Hypertrophy, and Fatty Disease of the Heart.—Dilatation of the heart has already been considered in relation to valvular disease as a cause, but it exists also as a disease *per se*. The walls, especially of the auricles and right ventricle, become thinned, and there may be fatty degeneration of the muscular tissue. The valves are also thinned, and the orifices may be unable to close.

Dilatation may be caused by over-exertion in feeble persons, or it may be the result of myocarditis associated with antecedent endocarditis and pericarditis. Fatty degeneration of the fibres of the heart may lead to dilatation, and so may fevers, anæmia, Grave's disease, and debilitating diseases. Chronic pulmonary disease (bronchitis, emphysema, pneumonia, &c.), by obstructing the circulation within the pulmonary blood-vessels, is a cause of dilatation of the right side of the heart.

The symptoms and signs of dilatation of the heart—whatever the cause—are the same as when the dilatation is the result of valvular disease. They are all caused by the failure of the heart to maintain the circulation, and hence the congestion of the lungs, liver, stomach, kidneys, &c., and the other changes leading to dropsy and death. Diffuse impulses may be seen, and felt, over the precordial area corresponding to the dilated cavities. The apex beat is lower and its impulse feeble. Percussion reveals enlargement *transversely* if the right side of the heart, and *vertically* if the left side, be dilated. Some hypertrophy may exist with the dilatation, especially when the left ventricle is affected. The first sound of the heart is feeble and flapping in character (lap' tup, instead of lubb' tup) and if the dilatation be sufficient to prevent the closure of the valves, soft blowing systolic murmurs may be heard at the mitral or tricuspid areas. The pulse is irregular, feeble, and quick. (See *Diagnosis of Chronic Valvular Disease*, p. 29).

Hypertrophy of the heart has also been referred to as a compensatory change in valvular disease. It may exist, however, without valvular disease being the cause, and it consists of increase of the muscular fibres of the heart, which are firmer than normal, unless fatty degeneration be also present, a change which may occur in the later stages. One or more of the cavities may be affected, and sometimes the heart may be enormous in size (*cor bovinum* or ox's heart). The causes of hypertrophy are over-action of the heart muscle, whether due to laborious occupations or to the abuse of such stimulants as coffee, tea, and alcohol, or by excessive smoking. Bright's disease and aneurism, as well as the chronic valvular diseases, are also causes of hypertrophy. The first group of causes gives rise to *general* hypertrophy.

The **symptoms and signs** of excessive hypertrophy are palpitation and an uneasy or oppressive feeling in the chest, with headache, dizziness, and ringing in the ears—all being due to the increased action of the heart. Bleeding at the nose is a common symptom. The chest wall may be prominent, especially in young patients, and the impulse of the heart is seen, and felt, to be markedly *heaving* in character. Percussion reveals enlargement extending in the vertical axis of the heart, but also transversely if the right auricle and ventricle be affected. The heart may extend as low as the sixth, seventh, or eighth intercostal space, and round as far as the left axillary line. The area of absolute dulness is increased when percussion is made with the patient in the erect position, and if the condition of the lungs be normal. The first sound is dull, muffled,

or "booming," and the second sound clear and accentuated. The pulse is strong, slow, full, and bounding.

Hypertrophy is to be distinguished from dilatation of the heart, pericardial effusion, and tumours of the mediastinum—the latter displacing the heart.

Dilatation and *hypertrophy* are chronic diseases, the dilatation being the more serious affection, liable to return, and ultimately ending in dropsy and death unless the cause be removable. Hypertrophy, even when excessive, may exist for years; but if the arteries become atheromatous there is great danger of cerebral hæmorrhage.

The **prognosis**, therefore, in both diseases is grave, and it should be guarded; but many cases of dilatation are curable, and this depends upon whether the cause be removable or not.

The **treatment** of *dilatation* consists of rest, digitalis, and iron tonics, as already indicated in the treatment when it is the result of chronic valvular disease. *Hypertrophy* may in itself be curative when associated with the dilatation; but when excessive, then rest, purgatives to lower the blood pressure, and tincture of aconite (three or four minims in water, thrice daily) become necessary. The aconite may be given in drop doses, frequently repeated. A low diet is indicated in hypertrophy, and iodide of potassium (ten or twenty grains thrice daily) is also useful.

Fatty disease of the heart may co-exist with, or be the result of, dilatation and hypertrophy, and the chronic valvular lesions. It also arises as an independent disease which has dilatation as a secondary effect.

Fatty *degeneration* means a replacement or change in the structure of the fibres; while fatty *deposit* implies a displacement with atrophy of the cardiac muscle by pressure. In the latter case the whole heart may be enveloped by a dense layer of fat. In fatty degeneration the disease may be general or may exist in patches, the muscular substance being pale-yellow, or speckled, and easily torn. The speckled appearance is best seen in the papillary muscles and trabeculæ. The early microscopical changes consist of cloudy swelling and granular deposit within the fibre cells. Ultimately the deposit is replaced by oil globules, and the striæ disappear.

The causes of fatty degeneration are pericarditis and myocarditis, atheroma of the coronary arteries, and prolonged anæmia; wasting diseases, fevers, and certain poisons as phosphorus, nicotine, &c.; and the chronic valvular diseases with dilatation and hypertrophy.

The **symptoms** are due to the weak action of the heart, the most significant being attacks of angina pectoris, Cheyne-Stokes' breathing, and a weak, slow intermittent pulse. The apical impulse is feeble or absent, and there is increased dulness if the heart be dilated, and perhaps also a systolic murmur. The heart-sounds may be reduplicated or almost inaudible. A waxy-looking skin may sometimes be observed in cases of fatty disease. The other physical signs are due to the dilatation of the heart, viz.:—congestion of the lungs, liver, stomach, kidneys, &c., terminating in dropsy and death.

The diagnosis, in many cases, can only be surmised; and often it

is only by the summation of the probabilities, with the presence of one or more of the causes, that fatty degeneration of the heart is suspected.

The **prognosis**, of course, is very serious, as cardiac failure or rupture may take place at any moment.

The **treatment** consists of nitrogenous diet, gentle but regular exercise, and tonics—as Easton's syrup, iron, and arsenic, &c.

Endocarditis and Pericarditis.—Endocarditis may be acute, chronic, or ulcerative. The chronic form has already been described along with the *valvular* diseases of the heart, and hence only the acute and ulcerative forms remain to be considered.

The *acute* form of endocarditis begins with hyperæmia of the endocardium. The cells proliferate and become cloudy, and soon minute capillary extravasations take place into the membrane, which loses its smooth character and becomes rough and opaque from inflammatory exudation. The fibrinous deposit upon the roughened valves leads to the formation of vegetations. If not excessive this condition may be recovered from by the absorption of these inflammatory products, but more usually it passes into the chronic form (see *Chronic Valvular Disease*, p. 18). It is almost always the mitral and aortic valves which become affected—chiefly the mitral; the tricuspid and pulmonary valves are only very seldom the seat of endocarditis, and then, generally, along with the valves of the *left* side of the heart.

The **causes** are rheumatism and other acute fevers—the endocarditis being regarded as the toxic effects of infective processes, probably microbic. Endocarditis frequently accompanies pericarditis and myocarditis; and it may occur, occasionally, as a secondary change in cases of pleurisy and pneumonia. It is often associated with chorea. It may (*rarely*) be primary or idiopathic, but in this respect it should be noted that frequently the valvular disease precedes the pain and swelling of the joints in acute rheumatic fever. In children the joint affection may be overlooked. Bright's disease is also a cause of endocarditis. Micro-organisms are found in the simple acute (benign) as well as in the ulcerative (infective) endocarditis (vide *infra*); but no specific microbe has, as yet, been demonstrated in simple acute endocarditis.

The **symptoms** of acute endocarditis are fever, with nausea, vomiting, and general *malaise*. When endocarditis occurs with rheumatism, or other fevers, the patient complains of uneasiness at the heart or palpitation, and there may be exacerbation of the temperature. The pulse is more rapid, and the general condition worse. There may, however, be no new symptoms, and, as the physical signs are distinctive, they should be carefully looked for in every case. The physical signs consist of the sudden development of these murmurs which have been described in chronic valvular disease of the heart; but it should be carefully noted that the presence of a soft blowing systolic murmur at the apex does not necessarily mean endocarditis. Its presence, however, may often be

inferred. It is, sometimes, not until dilatation of the heart takes place, with increase of the cardiac dulness, and engorgement of the pulmonary vessels with accentuation of the second pulmonary sound, that the diagnosis can be certainly made. In children, especially when pericarditis is present, the breathing is laboured. If the endocarditis be slight, the patient may entirely recover; but it is more frequent for it to become chronic. The duration of the acute attack is short; and the prognosis is not generally dangerous to life, but it must be guarded as regards the future health.

The **treatment** of acute endocarditis depends upon the causal disease (see *Rheumatism*). Absolute *rest* is necessary, and the application of ice to the precordial region may be tried. Iodide of potassium is useful to reduce the tension within the blood-vessels. Counter-irritation over the precordial region with strong iodine liniment is useful. Digitalis should not be given unless the heart be very rapid and feeble. The diet should be non-stimulating.

Ulcerative Endocarditis.—The **pathological changes** are at first similar to those of acute endocarditis, but the soft inflammatory swelling increases, and then breakes down. The cause of ulcerative (or infective) endocarditis is the presence of numerous microbes, chiefly of the septic and pyogenetic groups (streptococci and staphylococci). Sometimes it is due to the presence of the pneumococcus. Ulcerative endocarditis may be primary, or it may occur as a secondary complication of septic disease, fevers, &c. The source or entrance of the microbe may be skin, bone, *digestive tract* (ulcer), respiratory tract, &c. Bad hygienic conditions, in weakly persons, favour its development. Sometimes it attacks the valves in acute rheumatism; but the benign form of chronic valvular disease, taking on the septic form, is a commoner event. Clinically, four types are described, viz.—the septic, typhoid, cerebral, and cardiac.

The **symptoms** begin with severe rigors, or a "chill," with headache, nausea, and vomiting. The tongue is dry and furred, and the bowels may be constipated. Sometimes there is diarrhœa. There is great prostration, with delirium, stupor, and ultimately coma, the stools and urine being passed in bed. The spleen is enlarged, and jaundice may be present. Irregular exacerbations of the temperature, with increase in the rapidity of the pulse, and severe sweating, indicate pyæmic infection. Pyæmic infarctions within the lung give rise to dyspnœa, and frequently they light up pneumonia with its physical signs. Infarctions of the brain cause hemiplegia and convulsions; of the kidney, hæmaturia and albuminuria. Painless abscesses form rapidly in the joints. A loud systolic murmur is heard at the apex and base of the heart. The case may terminate fatally in less than a week, or it may run on for three or four weeks.

The **diagnosis** is not difficult when it occurs as a complication of acute rheumatism, but otherwise, it is extremely like typhoid fever, and it can only be differentiated by the history and the physical signs.

In the **treatment**, salicylic acid or benzoate of ammonia may be given, along with stimulants and strong nourishment. The cases of ulcerative endocarditis are very hopeless.

Pericarditis may be acute or chronic. The initial changes are the same as in other serous inflammations. The exudation begins at the base of the heart about the large blood-vessels. It may be tough, but sometimes it is soft, and it may affect a small area or be diffused over the whole pericardium. The lymph may present a honeycombed appearance, arranged in concentric rings which may be stripped off. The effusion is usually serous, but it may be a mixture of blood and serum, and only very rarely is it purulent. The quantity may be from three to eight ounces, but sometimes it is as much as three pints. Complete absorption may take place; or the lymph may, ultimately, cause adhesion of the visceral and parietal layers of the pericardium. These changes may terminate in calcification; or an effusion may remain and give rise to the chronic condition. Suppurative pericarditis occurs as a complication in pyæmic and scepticæmic conditions in injuries, and in extension of disease from other organs. [Its treatment is entirely surgical.]

The **causes** are chiefly Bright's disease, rheumatism, gout, and fevers. It may occur as the result of injury, or by the extension to the pericardium of other diseases—as pleurisy, pneumonia, chronic cardiac disease, aneurism, &c.; or by irritation produced by abscesses, caries of ribs, tumours, &c. It is doubtful if it ever occurs as an idiopathic disease, although, sometimes, it may appear to be so, and it may precede, by a few days, the joint symptoms in acute rheumatism. No *specific* germ has been found.

The **symptoms** are sometimes not very evident, especially when the pericarditis is associated with other diseases which cause it. There is frequently pain or uneasiness over the precordial region, and rapid action of the heart. There may be slight rigors in the apparently idiopathic form of the disease, or when the pericarditis arises in connection with non-febrile causal affections. When effusion takes place, and especially if large in quantity and suddenly, there is syncope, severe dyspnœa, and cough—the face being pale and anxious. The pulse is small, rapid, and in extreme cases often very irregular. Sometimes there is delirium and other cerebral symptoms, but these are due rather to the primary or other co-existing disease. Death may result from syncope, or by interference with the respiration—the lungs becoming œdematous, and dropsy setting in.

The earliest physical sign is *friction* at the base of the heart, which may, however, be absent if the exudation be soft. It is superficial in character, and it is not synchronous with the valvular sounds; and it is sometimes increased by pressure with the stethoscope. Inspiration and expiration, sometimes, produce alterations in the friction-sound. After effusion of serum, if the quantity be large, the heart-sounds are feeble and distant. There is sometimes an undulatory impulse to be observed, and the apex beat may *appear* to be higher. The diaphragm is sometimes pushed down, and the epigastric region may appear prominent. The chest wall, especially in young persons, may bulge out, and the intercostal spaces become widened from the second rib to the level of the sixth or seventh.

Ewart describes a *lifting* of the left clavicle, altering its relations to the first rib. The apex beat is very feeble, if felt at all. The dulness is much increased, and when mapped out upon the anterior wall of the chest, the area of dulness assumes a pyramidal form, the apex being upwards. The dulness begins at the base of the heart, and it may extend to the clavicle, and sometimes even above it, but it seldom extends lower than the sixth rib, except in extreme cases. Transversely, it may extend from an inch, or more, to the right of the lower part of the sternum to beyond the left mammary line, and changes of posture alter its limits. According to Rotch, dulness in the fifth right inter-cartilaginous space is an early sign in the diagnosis of effusion. The effusion may affect the lungs by pressure, and the physical signs of consolidation, due to collapse of the lung, may be made out, generally at the base of the left. Over the cardiac area the breath-sounds are distant, and the vocal resonance and fremitus are diminished. After absorption of the fluid the friction rub may return, and it may be sometimes felt (*friction fremitus*) now, or in the early stages.

Acute pericarditis may terminate by complete recovery in about three weeks; or in sudden death by syncope; or it may become more or less chronic in character, with adhesions to the chest wall. The chief signs of adhesion are depression of several intercostal spaces over the cardiac area during the heart's systole, and the fixed position of the apex-beat when the patient is turned over upon the left side. The obliterated pericardial sac may become calcified, and secondary changes—as dilatation and hypertrophy of the heart, with fatty degeneration—may ultimately result.

The **prognosis** must, therefore, be guarded. Pericarditis is a grave symptom in Bright's disease, generally ushering in a fatal termination. It is not so serious in acute rheumatism; but when the effusion is great in quantity, whatever be the cause, the patient is in great danger.

The **diagnosis** depends chiefly upon the physical signs, and, therefore, in all cases where pericarditis is known to be a possible complication, the chest should be carefully and frequently examined. Pericarditis and endocarditis require to be distinguished from each other, and both diseases are frequently present, as in acute rheumatism. Precordial pain indicates pericarditis, but it may be pleuritic in origin. An inflammatory pericardial effusion is to be differentiated from cardiac dilatation and hypertrophy, and from dropsy of the pericardium (hydropericardium). A pleuritic effusion of the left side may extend over the precordial region: and consolidation of the left lung may also simulate a pericardial effusion.

The **treatment** of acute pericarditis consists of keeping the patient entirely at rest; giving opiates or chloral for pain, or to calm the excited action of the heart; and continuing to treat the primary disease which is its cause. Opiates should not be given in Bright's disease. In the early stage, twenty grains of quinine may be given, and three or four leeches may be applied over the precordial and epigastric regions. Hot linseed poultices should then

be continuously used. After exudation, or even earlier, strong iodine liniment should be painted over the precordia, and the chest thereafter protected with a layer of wadding or warm flannel. Should the breathing become embarrassed, *paracentesis* of the pericardium is indicated. The chest should be thoroughly washed with carbolic lotion or other antiseptic, and the apparatus thoroughly cleansed by running strong (one in twenty) carbolic lotion through it, the aspirating needle being allowed to lie in carbolic lotion for ten minutes before using. A small incision is then made through the skin in the fifth left intercostal space, one inch from the left edge of the sternum, and the needle should be introduced slowly and firmly at that point. Only two or three ounces should be removed, unless the fluid be purulent, when more should be drawn off if possible. A preliminary puncture with a thoroughly clean hypodermic needle, may be made. Iodide of potassium with diuretics may be given in the later stages (℞ 7); or steel drops and other tonics (℞ 8). The diet should be light, and fluid nourishment only should be allowed. Brandy may be necessary if there be any tendency to syncope or collapse.

Functional Diseases of the Heart.

Palpitation—Irregularity and Intermittency—Tachycardia—Irritable Heart—Syncope—Angina Pectoris.

These morbid conditions have all been referred to as symptoms of grave organic disease of the heart, but they occur also as morbid conditions—the diagnosis being made by the process of exclusion, after a careful *physical* examination.

Palpitation of the heart has the following additional *causes*, viz.:—nervous exhaustion—the result of anæmia, debilitating diseases, and venereal excesses, &c.; the abuse of tea, alcohol, and tobacco; and reflex disturbances from flatulent distention, indigestible food, pregnancy, &c. It occurs also as a symptom in Bright's disease, gout, hysteria, and exophthalmic goitre; and it may be produced by cerebral excitement, prolonged mental work, emotions, &c. The sensations in the neurotic forms may be due to palpitation of the aorta—the abdominal portion usually—the heart being unaffected, although murmurs may be temporarily present.

Irregularity and intermittency of the heart's action may also be due to grave organic disease, or they may exist as functional disorders. They indicate either cardiac failure, or an interference with the nervous apparatus of the heart, aud they are frequently found along with palpitation as symptoms. In gouty subjects, irregularity may exist for a long period of years without materially affecting the health, and, therefore, in such cases the prognosis is not so grave. It is well to note that the radial pulse does not *always* correspond with the heart's beat.

Tachycardia means a very rapid pulse; and the name may be used to denote a functional disorder, as it is associated with other symptoms. The attacks are generally sudden, and may last from a few hours to three or four days. There is great restlessness and anxiety, cold extremities or numbness, with a feeling of tightness or oppression at the heart. The pulse-beats may be 120 to 200 a minute. Sometimes, after a continued attack, the cardiac dulness is increased. There is polyuria, but at first the urine may be scanty. The causes are not ascertained. Grave's disease, when not accompanied by enlargement of the thyroid, nor by protrusion of the eyeballs, has to be noted in the diagnosis. Digitalis may be tried in the treatment. Compression of the chest relieves, and sometimes cuts short the attack. [*Bradycardia* is the name given to the opposite condition. It simply means a *slow* pulse.]

Irritable heart is a condition described by Da Costa, characterised by palpitation and irregular heart's action, due to excitement and hard physical work, in individuals who have not had any preliminary training. It may also, however, be the result of irregular habits of life in the young.

The "weak heart" of neurotic patients, and the true *cardiac asthenia* of overwork and worry, are too familiar to need description, and may be conveniently included in this group.

The *treatment* of the foregoing group, apart from cardiac disease, depends entirely upon the cause. Remove all sources of reflex disturbance. During an attack brandy or sal volatile should be given, and mustard may be applied to the precordial region. If due to shock, give a hypodermic injection of morphia—one-fourth of a grain—and repeat the dose in a few hours if necessary. The diet should be light, and four or five hours should intervene between meals. Strong soups, beef-tea, and milk should be ordered, and only limited quantities of solid food allowed. Pepsin and mineral acids may be given when palpitation occurs as a symptom of dyspepsia. Attention to the bowels, and regular exercise, should be encouraged. *Strychnine* ($\frac{1}{30}$ gr.) is the drug most used. It should be continued for some time. Digitalis and caffeine are useful remedies; and so also are arsenic and iron when the palpitation is the result of nervous exhaustion or debilitating disease. Bromides should be given when due to cerebral irritation and overwork, and the patient should be warned to avoid all sources of excitement and strong emotions. A belladonna plaster may with benefit be applied to the precordial region.

Syncope.—Fainting may be a symptom of organic disease of the heart, but it also occurs as a functional disorder. The patient becomes pale, faint, and giddy, the breathing is sighing or gasping in character, and there is dimness of vision, ringing in the ears, and mental confusion. In extreme cases there is insensibility more or less complete, the pupils being dilated; and when the patient is unconscious the sphincters may relax and the urine and fæces be passed involuntarily. The pulse is rapid, feeble, and often irregular. The cardiac sounds and impulse are weak, and the attack may terminate in profuse perspiration or vomiting. There may be slight convulsive movements during the attack. Unless due to grave heart disease, or the result of severe hæmorrhage or prolonged