

of dissecting aneurisms is 60. Of these 47 were interparietal or septal. In 30 cases the left ventricle was the site of the aneurism. The interparietal form occurs in the peri-aortic space of Vestberg, from which the blood may dissect into the auricular or ventricular septum. In 16 cases the point of origin was in the sinus of Valsalva. Acute ulcerative endocarditis is the cause in the majority of cases; in other cases abscess, atheroma, and trauma were the causal factors. Dissecting aneurisms of the aorta may extend into the walls of the heart and through secondary rupture become converted into dissecting cardiac aneurisms.

DIAGNOSIS.—The diagnosis of cardiac aneurism is in the majority of cases impossible; it is usually made at the autopsy table. In the case of acute aneurism the symptoms are those of acute myocarditis; in the chronic form they cannot, as a rule, be separated from those of chronic myocarditis. The aneurism is usually so small as to present no characteristic physical signs. In rare cases the sac has caused erosion of the thoracic wall, forming a visible tumor. The results of percussion and auscultation are very uncertain guides, and though in individual cases unusual murmurs may be produced, they are not constant or characteristic enough to be of diagnostic significance. The Roentgen ray has recently been applied to the differential diagnosis of this condition, and the location, size, and form of the aneurismal dilatation have been shown by this means.

PROGNOSIS.—The prognosis in the majority of cases is not favorable. In early and undoubted syphilitic cases it is relatively better. The terminations are very variable. After reaching a certain degree of dilatation the process may remain stationary. The sac may be obliterated by thrombosis; calcification of the thrombus may occur. Death usually results from cardiac insufficiency to which other factors than the aneurism may contribute. In other cases gradual increase of size with resulting rupture takes place.

TREATMENT.—The treatment in suspected cases is along the general lines indicated in myocardial and valvular diseases. The possibility of syphilis should always be considered.

Aldred Scott Warthin.

HEART DISEASES: ANEURISM OF VALVES.—A valvular aneurism is a cavity in the substance of the valve itself, containing pus and other inflammatory products, or blood clots and debris. The origin seems to be always in endocarditis of a more or less acute form, of which this is really only one of the possible results. If the process starts on the surface of the valve, ulceration may perforate one layer, after which the blood pressure dissects away the other, and so dilates the cavity that it may be as large as a pigeon's egg. On the other hand, the process may begin in the tissue of the valve and result in perforation of one of the layers from within, after which the blood pressure acts precisely as in the former case. These aneurisms are generally single, but may be multiple, and seem to be confined to the left heart. Though many authorities state that aneurisms are most commonly found in the aortic valves, the review of the literature made by Drasche shows that they are more frequently located in the mitral valve and that the anterior leaflet is more often affected than the posterior. Of the 23 cases collected by Pelvet, in 16 the aneurism was on the mitral, in 7 on the aortic valve. The perforation is almost always found on the side of the valve which is exposed to the highest pressure—the ventricular surface of the mitral, the distal surface of the aortic. The cavity may be lined by a laminated clot. The layer of the valve opposite to that containing the perforation may rupture, and the valve then suddenly become insufficient. The symptoms in such a case might be precisely similar to those of valvular rupture from any other cause.

Aneurisms have also been found, though rarely, in the valves of the right heart. As may be readily understood, valvular aneurism is of pathological rather than clinical interest, inasmuch as it betrays its presence by

no distinctive diagnostic mark. Acute endocarditis can usually be detected, and so also valvular incompetence, but the precise steps which have led from one to the other in any given case must remain highly uncertain. This being the case there is, of course, no special treatment to be recommended other than that suitable to acute endocarditis. It would seem that the affection occasionally becomes chronic when seated in the mitral curtains, and is, therefore, somewhat less serious than in the semilunar cusps.

There is one other and more chronic condition which is sometimes classed as valvular aneurism. A portion of, or the whole valve, namely, may become so modified by inflammatory changes that its tissue generally yields and becomes stretched by the force of the blood pressure—both layers of the valve remaining in apposition, but being bellied out with the convexity toward the left auricle or ventricle respectively, according as the changes are seated in the mitral or in the aortic valve.

Frederick C. Shattuck.

HEART DISEASES: ANIMAL PARASITES.—Animal parasites are but rarely found in the human heart. The echinococcus is the most frequent and the only one likely to give rise to serious symptoms. The heart is involved in about one per cent. of all cases of echinococcus infection. In a large per cent. of cases the heart alone was involved. The cysts are found much more frequently in the right side of the heart. They may vary in size from a pinhead to an orange or even larger. In one case in which the hydatid was situated in the left ventricle the enlargement of the heart was so great as to displace and compress both lungs. The cysts may be single or multiple; in one case eighty were found forming a grape-like cluster extending from the right auricle into the ventricle through the tricuspid orifice. As a rule the hydatid develops within the wall, but it may occasionally project as a pedunculated cyst into the heart cavity or into the pericardial sac. In both cases the origin of the cyst is in the myocardium, but as the hydatid increases in size the muscle is either pushed aside or becomes atrophic, and may finally disappear, the cyst then coming to project either upon the pericardial or upon the endocardial surface. The pedicle consists of a portion of the overlying pericardium or endocardium. In rare cases the cyst may extend entirely through the wall, forming a fluctuating tumor covered on one side by pericardium and on the other by endocardium. The large hydatids may contain numerous daughter cysts, varying in size from a pea to a pigeon's egg. The heart muscle in the immediate neighborhood of the cyst may show no changes or the muscle fibres may be atrophic. The thickness of the cyst wall varies from 1 to 5 mm., but this may be much increased by fibroid changes in the overlying peri- or endocardium.

Small hydatids of the myocardium not projecting into the pericardial sac or heart cavity produce no symptoms and are usually discovered only at autopsy. When the cyst projects into the cavity of the pericardium, pericarditis may be produced, and this may in turn give rise to a pleuritis by direct extension. Subpericardial hydatids, however, do not always excite pericarditis. In neither case are the symptoms characteristic. Hydatids projecting into the heart cavity are very likely to rupture. In this event sudden death may result from the embolism of the daughter cysts. In the great majority of cases the perforation is into the right heart, the cysts blocking either the tricuspid orifice or the pulmonary artery. Smaller cysts may pass through the main pulmonary branches and lead to embolism of the smaller arteries and the formation of multiple hydatids throughout the lung. Death may result in such cases from pneumonia, slowly developing pleuritis, general cachexia, etc. Partial obstruction of the pulmonary orifices may give rise to symptoms of pulmonary stenosis and insufficiency. Rupture of an echinococcus cyst into the left heart may lead to blocking of the aortic orifice with resulting stenosis and insufficiency, or smaller cysts may cause occlu-

sion of peripheral arteries, leading to local gangrenous conditions. In one case rupture occurred into both the right and the left heart. Embolism of echinococcus cysts in the right heart or pulmonary vessels may also occur as the result of the rupture of primary hydatids into the large veins. This occurs most frequently in the case of liver hydatids.

The differential diagnosis of heart hydatids is in the majority of cases impossible. The condition may be suspected when hydatids are present in other parts of the body, or from the nature of the emboli when embolism occurs. In one of the reported cases, in which there were numerous metastases throughout the lung, small cysts were found in the sputum. Aspiration of the pericardial sac and microscopical examination of the fluid thus obtained may lead to the recognition of the condition. In those cases in which the cysts do not rupture or project into the pericardial sac the symptoms are of a very indefinite nature and may suggest either myocarditis or valvular lesions. The treatment is entirely symptomatic. In certain cases surgical interference may be of avail. Goodhart claimed to have cured a case of hydatid cyst of the cardiac wall.

The cysticercus cellulosa is of rare occurrence in the heart, only about thirty cases having been reported. The left ventricle appears to be most frequently affected. The cysts are usually few in number, the size varying from a bean to a hazelnut, rarely larger. They may be found in the muscle or just beneath the endo- or pericardium. As in the case of the echinococcus hydatids they may project from the endocardial surface into the blood stream, being attached to the wall by a slender pedicle formed by the endocardium. The layer of endocardium over the cyst may become very much thickened. The condition cannot be diagnosed during life, the symptoms being of a very indefinite character or entirely wanting.

Trichina spiralis is stated by many writers never to occur in heart muscle, but cases of such occurrence have been observed by Leuckart, von Zenker, and Fiedler. Pentastoma denticulatum has also been found in the heart wall. In the case of both of these parasites the affection of the heart is of pathological interest only.

Aldred Scott Warthin.

HEART DISEASES: DISPLACEMENTS.—DEFINITIONS AND VARIETIES.—The heart, in a state of health, is subject to certain changes of position, caused, first, by the respiratory movements, and, second, by alterations in the bodily posture. Abnormal displacements of the organ may be either congenital or acquired. The latter only—or those that occur as the result of disease—will be considered.

In studying the displacements of the heart it is important to remember that the organ is held *in situ* directly by the great vessels, and only indirectly, through the pericardium, by the diaphragm. The attachments, fixing only the base of the heart, permit free play to the body of the organ, which hangs loosely in the pericardial sac, and very easily undergoes displacement laterally or vertically, while its dislocation either forward or backward is exceedingly rare. This statement, however, points only to a broad general classification of the disorders in question, since the heart is very seldom displaced in an absolutely horizontal, or in an absolutely vertical, plane.

MORBID ANATOMY.—It is noteworthy that the amount of dislocation actually found after death is usually less than the physical signs during life have led one to expect. The most obvious, though less important, change which the heart undergoes is a disturbance of its normal relations to adjacent structures. Compression of the cardiac walls, which may occur to a greater or less degree in the pressure class of cases, may be the more important condition. The pericardium is sometimes displaced with the heart, or greatly stretched, and the great vessels at the base of the heart and at the root of the neck may be stretched and twisted, their change in position varying with the direction and extent of cardiac dis-

placement. In some instances the circulation in the vessels is seriously impeded. Occasionally the pericardium and heart become adherent, and adhesions between the pericardium and pleura fix the heart in its abnormal position.

The functional disturbances resulting from these alterations vary with the cause of the displacement. In those which are due to pressure, the heart, if healthy, suffers little or no real compression, even when the dislocation is effected rapidly; and if it is displaced in front of, and in contact with, a solid tumor, such as an aneurism, a solidified lung, or the spinal column, its impulses may be so vigorous and diffused as to be mistaken for cardiac hypertrophy. But if the heart is diseased, and especially if its walls are degenerated, or its cavities much dilated, sudden compression, although moderate, may cause embarrassment of the cardiac action, and even induce a fatal syncope. In those displacements which are due to retraction of either lung, the heart is displaced toward the retracted side, partly by traction, and partly by extra-distention of the opposite lung, and the effects upon the functional activity of the heart are comparatively slight. In very rare cases the heart, when displaced, becomes involved in the inflammatory process of the lung or pleura, which leads to the displacement, and fibroid changes in its walls, occurring secondary to adhesions, ultimately interfere greatly with the heart power.

ETIOLOGY.—The causes of acquired displacement of the heart are most conveniently arranged in two classes: first, conditions that exert pressure, and second, conditions that exert traction upon the heart. On the same principle all cardiac displacements have been placed under the two heads of "excentric" and "concentric." In the former of the above classes, the heart may be pressed or pushed out of position by fluid effusions into either pleural cavity. This is by far the most frequent cause of lateral displacement. Pneumothorax will also push the heart to one side, and when accompanied by perforation and inflammatory effusion, will carry the displacement to its utmost possible limit. Hydrothorax being usually double, and, therefore, pressing equally on both sides of the heart, does not displace the organ laterally, but downward. Intrathoracic tumors, aneurisms, and abscesses sometimes press the heart to the right or the left. Hypertrophy and emphysema, or other causes of enlargement of the lungs, occasionally operate in the same way, as also does extensive pneumonic consolidation. Pericardial effusion, when considerable, but not extensive, may push the apex into a position corresponding to the left nipple, or even above it. Cardiac displacement may also depend upon various abdominal conditions, as gaseous distention of the stomach and intestines, enlargement of the liver or spleen, the pregnant uterus, abdominal tumors or ascites. Diaphragmatic hernia or abscesses in extremely rare cases cause displacement of the heart upward.

In the second class of cases the displacement is concentric, that is, toward the origin of the displacing force. This movement takes place during absorption of pleuritic effusions, with imperfect expansion of the lung; and in consequence of a fibroid phthisical process or cirrhosis of the lung causing a gradual decrease in its volume. The heart also suffers traction in some forms of deformity of the chest dependent upon curvature of the spine. It must be observed, however, that in all these instances the displacing force is in reality one of pressure, resulting in displacement from removal of the normal counter-pressure. In certain cases, however, actual traction undoubtedly occurs, as when the pericardium becomes involved in a cirrhotic process in the lungs, or in an adhesive pleurisy, and it and the heart are displaced by the subsequent retraction.

Since displacement of the heart is a purely mechanical process, its motion will be subject to the universal law of moving bodies; that is, it will take the direction of least resistance, or of the resultant of all the acting forces. The more common elements of this resultant are:

1. The restraining force of the cardiac attachments, particularly at its base.
2. The density and resistance of the surrounding tissues. This latter may be positive, as in case of a solid tumor, or negative, as in pneumothorax.
3. The weight of the heart is, as a rule, of slight importance. In cardiac hypertrophy, however, it may be sufficient to produce temporarily, during decubitus on the left side, a decided displacement.
4. The direct exciting cause either of pressure or of traction.

These elements may produce one or both of two forms of motion—either distinct displacement or rotation of the heart about one of its axes. Rotation, owing to the peculiar attachments of the heart, is almost invariably about the long axis, or a fixed point at the base.

Passing now to a special consideration of the causes operative in the several varieties of displacement, we find that displacement toward the left, which is most common, is brought about by contraction of the left lung by accumulation of fluid or air in the right pleural cavity, or by solid enlargements of the right lung or right lobe of the liver. Displacement toward the right is most frequently due to the presence of fluid or air in the left pleural sac, but may also result from contraction of the right lung consequent upon chronic pleurisy or fibroid phthisis; and from the development of tumors in the left side of the chest or mediastinum. Displacement downward may be caused by aneurisms or solid tumors, emphysema of the lungs, etc., in the thorax, or by collapse of the stomach or intestines. Displacement upward may be due to solid, liquid, or gaseous accumulations in the abdominal cavity, ovarian tumors, enlargement of the liver, fibroid tumors of the uterus, etc. Enlargement of the left lobe of the liver usually displaces the heart upward and to the left, while great enlargement of the spleen may push it upward and to the right. Enlargement of the liver from abscesses will also raise the organ somewhat, a fact which may become very valuable as a means of distinguishing between hepatic abscess and abscess in the abdominal wall over the liver. Another cause of this displacement is contraction of the upper part of either lung, the most common pathological condition being phthisis. Forward displacements are usually caused by an aneurism, or a solid tumor in the posterior mediastinum. Backward displacement may be produced by tumors in the anterior mediastinum, collections of air, pus, or blood in the same situations, or a posterior exostosis of the sternum.

SYMPTOMS AND PHYSICAL SIGNS.—Simple displacement of the heart, unattended by compression of its walls or torsion of the great vessels, causes no distinctive subjective symptoms. This is especially true when the displacement has been gradual. When it has been rapid, however, or is due to pressure, symptoms of embarrassed cardiac action may be developed suddenly. They commonly consist of precordial oppression, more or less severe pain, amounting even to true angina; palpitation with its accompanying peculiar sense of lack of breath, which may increase until it becomes absolute dyspnea; a weak, irregular pulse, and a pale or cyanotic countenance. Such sudden compression results most frequently from a rapidly developed gaseous distention of the stomach or intestines, and may quickly become dangerous, and, if not relieved, produce collapse and death.

Lateral displacements are usually more readily detected when occurring toward the right than toward the left side. In the former case the apex beat not infrequently corresponds to the right nipple, between the fifth and seventh ribs, the apex itself being usually raised by the width of an intercostal space above the normal level. In displacement toward the left the apex beat may be observed in the axillary region, with little or no perceptible movement at the normal situation of the apex.

Dr. Douglas Powell has shown that in right lateral displacement the apex of the heart is depressed, but never so as to occupy a position external to the base;

whereas in displacements to the left the apex is relatively elevated, and the long axis of the heart is nearly or quite horizontal. According to Hayden, the distinctive features of lateral displacement from liquid effusion into the opposite pleura are the slow and mensurable mode of its occurrence; percussion dulness on the side whence the heart has been displaced, and clearness on the opposite side, beyond the limit of cardiac dulness; and, in the event of the removal of the displacing medium, return of the heart to its natural situation, or beyond it when the lung previously compressed has become incapable of expansion. Since the apex of the heart is so much more movable than its base, it is evident that, in cases of displacement, the maximum points of its sounds will not be equally removed from their normal situation. Thus, in left pleuritic effusion, when the maximum point of the first sound is carried out of place to the extent of seven or eight inches, the maximum point of the second sound is scarcely ever changed more than an inch and a half. In displacement to the right a systolic murmur has been noticed, which is ascribed to a twisting of the great vessels. When displacement of the heart is caused by cancer of the lung or pleura—with or without effusion of serum—two diagnostic symptoms of great value are especially to be noted, viz., enlargement of the subcutaneous veins of the affected side of the chest, and distinct transmission, on the same side, of the sounds of the heart. These signs, when accompanied by dulness on percussion, absence of respiratory sounds, and vocal fremitus, except at the root of the lung, and by excentric displacement of the heart, become pathognomonic of cancer of the lung or pleura.

In downward displacement the heart not only lies lower than usual, but it generally sways a little to the right. Displacement in this direction is limited by the diaphragm, and by the attachments at the base of the heart. It is most frequently caused by emphysema of the lungs, which constitutes, in fact, one of the most valuable signs in this form of displacement. If the apex beat is perceptible at all, it is situated below and to the left of its normal position. There is pulmonary resonance instead of dulness in the precordial area, and the cardiac sounds are transferred to the epigastric triangle and the lower left cartilages.

Upward displacement appears to reach its maximum when resulting from ovarian dropsy. In some of these cases distinct impulse is not to be felt below the second interspace. The sounds of the heart are carried upward and weakened. In pericardial effusion the cardiac impulse may correspond in position to the left nipple, or even be shifted farther in that direction. When the effusion is very copious the apex beat may be completely obscured.

Backward displacement occurs most frequently in connection with other forms of dislocation. It is unaccompanied by any physical signs due directly to the condition itself.

Forward displacement is ascertained with difficulty. The physical signs are: Increase of the area and strength of pulsation and of precordial dulness; bulging of the same sometimes is noticed in young subjects. The cardiac sounds are intensified.

DIAGNOSIS.—The diagnosis of acquired displacements of the heart is to be made by the position of the apex beat, and of the impulse of the organ generally, by the altered locality of cardiac percussion dulness, and by the comparative intensity of the heart's sounds, more especially of the first, at different parts of the chest. The chief conditions which simulate cardiac dislocation are the following: Physiological displacements, to which reference was made at the outset; precordial bulging in cardiac hypertrophy; intrathoracic tumors and aneurisms lying behind the heart and pushing it forward—thus producing the closest possible resemblance to cardiac hypertrophy; adhesions of the pericardium; atrophy of the lungs.

PROGNOSIS.—Displacements of the heart being, in most instances, attended by only a slight amount of functional

disturbance, and oftentimes by none at all, their prognosis is determined by the disease in which they originate. As already mentioned, when they are accompanied by sudden and violent compression of the heart, these symptoms, if not relieved in time, may result fatally. Usually, however, the direct consequences of these displacements are annoying rather than serious.

TREATMENT.—There is no direct treatment of cardiac displacements, they are to be remedied only by the removal of their cause; but this, in the traction class of cases, is very rarely possible. In those, however, which result from pressure, treatment is often both urgently indicated and highly successful. The troublesome pulsation which is sometimes experienced may frequently be relieved by the simple application of a belladonna plaster, with assurances as to the unimportance of the symptom.

Alfred L. Loomis.

HEART DISEASES: ENDOCARDITIS.—Endocarditis is an inflammation of the endocardium, *i.e.*, of the membrane lining the cavities and valves of the heart. In the great majority of cases the valvular endocardium is alone involved.

CLASSIFICATION.—Endocarditis is divided into two large classes, acute and chronic. We shall confine ourselves chiefly to a description of the acute form. Chronic endocarditis is practically synonymous with chronic valvular disease of the heart.

Acute endocarditis is divided into benign and malignant. These are differentiated both clinically and pathologically. The synonyms of benign are simple, rheumatic, verrucose and papillary; those of malignant are ulcerative and infective. It must be remembered that the distinction between benign and malignant is one not of kind, but of degree, as all stages between the two are found, and the same bacteria may be present in both.

HISTORY.—Bouillaud first recognized endocarditis as a distinct disease, publishing an account of it in his work on the heart and vessels in 1824. The discovery of the stethoscope by Laënnec made it possible to recognize endocarditis during life. Previous to this time it was impossible to diagnose this disease with any degree of certainty on account of its indefinite and unreliable symptomatology. In 1814 Kreysig of Dresden devoted special attention to inflammation of the lining membrane of the heart. Bouillaud by means of the signs furnished by Laënnec was able accurately to localize the endocarditis on certain valves. He declared there was a close relationship existing between rheumatism and endocarditis. He also called attention to the fact that other diseases than rheumatism, for instance, pneumonia, might produce endocarditis. He recognized likewise the fact that the acute form might be attended by symptoms of pyæmia. Virchow described the process of embolism, thus explaining the obscure complications on the part of the

brain and kidneys, so intimately associated with endocarditis. Following this the important additions to our knowledge of the disease have been made by bacteriologists. Klebs in 1878 was the pioneer and insisted upon it that the various bacteria of any one of the infectious diseases might colonize on the endocardium and produce endocarditis. He showed that both the benign and the malignant forms were caused by bacteria. Litten found the same micro-organism in both forms and showed that there was no abrupt, but only a gradual difference between the two. Since this time multitudinous investigations have been made by bacteriologists all over the world, largely increasing our knowledge of the etiology of the disease.

BACTERIOLOGY.—The following bacteria have been found in the vegetations of endocarditis: Streptococci, staphylococci, pneumococci, and gonococci most frequently; less often the bacteria of typhoid fever, anthrax, diphtheria, tuberculosis, influenza, and the *Bacterium coli communis*.

ETIOLOGY.—Acute endocarditis is in most cases a product of bacterial activity. It is usually secondary to the various infectious diseases. When, as rarely happens, a causative factor cannot be found, it is termed cryptogenic. Bacteria cannot always be demonstrated, but this may be due to the fact that they are likely to disappear as the vegetation becomes old. Sometimes it is possible to demonstrate them only by culture methods.

Since the time of Bouillaud acute articular rheumatism has been recognized as the most important associate of endocarditis. It is incorrect to speak of it as a cause, since it, like endocarditis, is the result of bacterial activity, with different localizations. When the germ or its

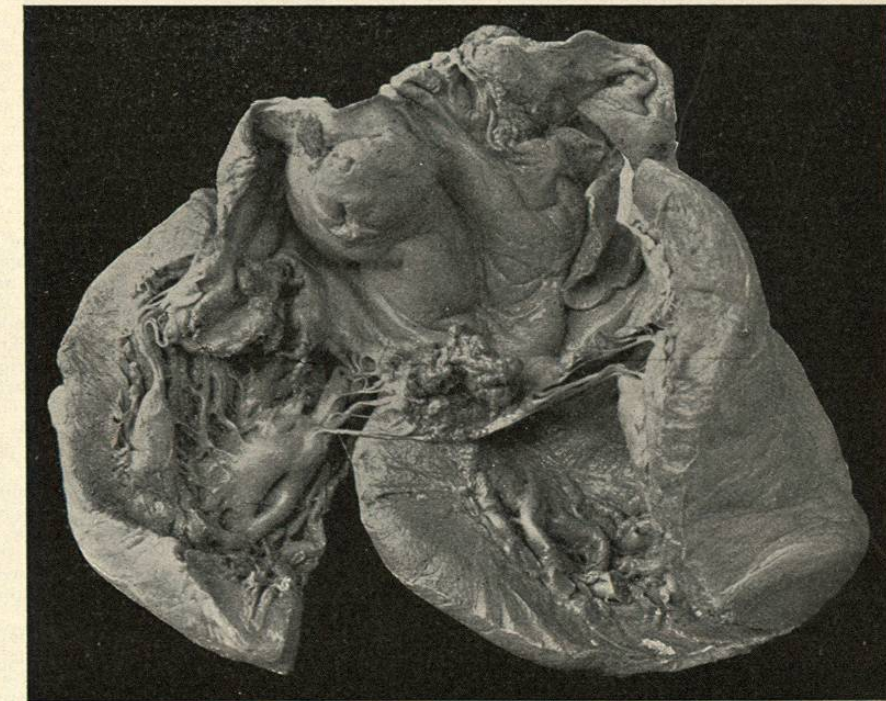


FIG. 2590.—Malignant Endocarditis Involving the Mitral Valves and the Left Auricle. (Original.)

toxin attacks the joint it is rheumatism; when the endocardium, endocarditis. In a certain percentage of cases, the pericardium is attacked either alone or together with the endocardium.

Chorea seems to have a special association with endocarditis. The vast majority of fatal cases show endo-