II. DISEASES OF THE HEART.

I. ENDOCARDITIS.

Inflammation of the lining membrane of the heart is usually confined to the valves, so that the term is practically synonymous with valvular endocarditis. It occurs in two forms—*acute*, characterized by the presence of vegetations with loss of continuity or of substance in the valve tissues; *chronic*, a slow sclerotic change, resulting in thickening, puckering, and deformity.

Acute Endocarditis.

This occurs in rare instances as a primary, independent affection; but in the great majority of cases it is an accident in various infective processes, so that in reality the disease does not constitute an etiological entity.

For convenience of description we speak of a simple or benign, and a malignant or ulcerative endocarditis, between which, however, there is no essential anatomical difference, as all gradations can be traced, and they represent but different degrees of intensity of the same process.

Simple Endocarditis.—This is characterized by the presence on the valves or on the lining membrane of the chambers of minute vegetations, ranging from 1 to 4 mm. in size, with an irregular and fissured surface, giving to them a warty or verrucose appearance. Often these little cauliflower-like excrescences are attached by very narrow pedicles. It is rare to see any swelling or infiltration of the endocardium in the neighborhood of even the smallest of the granulations, and although small capillary vessels do exist at the edges of the valves, redness, indicative of the injection or distention of the vessels, is extremely rare. With time the vegetations may increase greatly in size, but in what may be called simple endocarditis the size rarely exceeds that mentioned above. The finer changes in the process consist of the proliferation of the subendothelial connective-tissue elements, resulting in a small-celled infiltration. What part, if any, the endothelial cells play in this is not accurately known. The superficial elements undergo a coagulation necrosis, and fibrin is deposited from the blood, often in layers. Practically a vegetation is a small area of granulation tissue capped with fibrin. Micro-organisms are present, entangled in the granular and fibrillated fibrin, but whether they constitute an essential and constant element in all cases of simple endocarditis has not yet been decided.

The further changes in the vegetation may be either in the direction of increased proliferation of the connective-tissue elements of the valve, forming an extensive area of necrosis and the production of the condition which, from its more intense grade, we speak of as malignant or ulcerative endocarditis; or, as is more usual, healing occurs. The vegetation is

absorbed, and there remains a small nodular thickening of the valve. A third possibility is the dislocation of a vegetation with transference as an embolus to a distant part of the circulation. It is to be noted, however, that this untoward event is rare in acute endocarditis associated with febrile affections, whereas it is by no means uncommon in the simple endocarditis which occurs so constantly on old sclerotic valves.

Anatomically, in the majority of instances of acute endocarditis, cicatrization of the granulation tissue takes place in time, with but little damage to the valve beyond slight nodular thickening. The essential danger is remote and results from the slow changes in the valve tissue, which are so apt to follow an acute inflammation. Why this should be so cannot at present be explained; but the fact remains that the simple endocarditis, harmless in itself, such as we meet with in rheumatism or in chorea, lays the foundation of subsequent organic lesions, owing to the initiation of nutritive changes leading to sclerosis with contraction and deformity.

Endocarditis is much more common on the left side of the heart and involves the valvular endocardium in the great majority of cases. During fœtal life the right side of the heart is often affected. The chordæ tendineæ are sometimes involved with the valves, rarely alone. The mitral valves are more often affected than the aortic. On the mitral segment the vegetations are usually on the auricular face, not at the margin, but at a distance of 2 or 3 mm., forming a row of bead-like outgrowths. So, too, on the aortic segment they are not seen on the free margin, but just below, on the ventricular face, following the margin of the so-called lunated spaces. In both the valves this peculiar distribution follows, as Sibson suggests, the lines of maximum contact.

Etiology.—Simple endocarditis does not constitute a disease of itself, but is invariably found with some other affection. The general experience of the profession has confirmed the original observation of Bouillaud as to the frequency of association of simple endocarditis with acute articular rheumatism. Possibly it is nothing in the disease itself, but simply an altered state of the fluid media—a reduction perhaps of the lethal influences which they normally exert—permitting the invasion of the blood by certain micro-organisms. Tonsillitis, which in some forms is regarded as a rheumatic affection, may be complicated with endocarditis. Of the specific diseases of childhood it is not uncommon in scarlet fever, while it is rare in measles and chicken-pox. In diphtheria simple endocarditis is rare. It was not present in a single instance of 30 autopsies which I made in this disease at the Montreal General Hospital. In small-pox it is not common. It is stated to be more frequent in typhoid fever but was not present in 65 post-mortems in this disease.

In pneumonia both simple and malignant endocarditis are common. In 100 autopsies in this disease made at the Montreal General Hospital there were 5 instances of the former. Acute endocarditis is by no

means rare in phthisis. I have met with it in 12 cases in 216 post-mortems.

In chorea simple warty vegetations are found on the valves in a large majority of all fatal cases. There is no disease in which, post mortem, acute endocarditis has been so frequently found. And lastly, simple endocarditis is met with in diseases associated with loss of flesh and progressive debility, as cancer, and such disorders as gout, diabetes, and Bright's disease.

A very common form is that which occurs on the sclerotic valves in old heart-disease—the so-called recurring endocarditis.

Symptoms.—Neither the clinical course nor the physical signs are in any respect characteristic. The great majority of the cases are latent and there is no indication whatever of cardiac mischief. Experience has taught us that endocarditis is frequently found post mortem in persons in whom it was not suspected during life. There are certain features, however, by which its presence is indicated with a degree of probability. The patient, as a rule, does not complain of any pain or cardiac distress. In a case of acute rheumatism, for example, the symptoms to excite suspicion would be increased rapidity of the heart's action, perhaps slight irregularity, and an increase in the fever without aggravation of the joint trouble. Rows of tiny vegetations on the mitral or on the aortic segments seem a trifling matter to excite fever and it is difficult in the endocarditis of febrile processes to say definitely in every instance that an increase in the fever depends upon the endocardial complication. But a study of the recurring endocarditis—which is of the warty variety, consisting of minute beads on old sclerotic valves—shows that this process may be associated, for days or weeks at a time, with slight fever ranging from 100° to 102½°. Palpitation may be a marked feature and is a symptom upon which certain authors lay great stress.

The *diagnosis* of the condition rests upon physical signs which are notoriously uncertain. The presence of a murmur at one or other of the cardiac areas in a case of fever is often regarded as indicative of the existence of endocarditis. This extremely common mistake has arisen from the fact that the *bruit de souffle* or bellows murmur is common to endocarditis and a number of other conditions which have nothing to do with it. At first there may be only a slight roughening of the first sound, which may gradually develop into a distinct murmur. Taken alone, it is, however, a very uncertain and fallacious sign.

Malignant Endocarditis.—Acute endocarditis of a malignant character is met with:

(*a*) As a primary disease of the lining membrane of the heart or of its valves.

(*b*) As a secondary affection in acute rheumatism, pneumonia, and in various specific fevers; or as an associated condition in septic processes.

It is also known by the names of ulcerative, infectious, or diphtheritic endocarditis, but the term malignant seems most appropriate to characterize the essential clinical features of the disease.

Etiology.—The existence of a primary endocarditis has been doubted; but there are instances in which persons previously in good health, without any history of affections with which endocarditis is usually associated, have been attacked with symptoms resembling severe typhus or typhoid. In one case which I saw death occurred on the sixth day and no lesions were found other than those of malignant endocarditis.

Rheumatism, with which simple endocarditis is frequently associated, is not so often complicated with the malignant form. Thus, in only 24 of 209 cases the symptoms of severe endocarditis arose in the progress of acute or subacute rheumatism. In only 3 of the Montreal cases was there a history of rheumatism either before or during the attacks.

Malignant endocarditis is extremely rare in chorea. Of all acute diseases complicated with severe endocarditis pneumonia probably heads the list. This fact, which had been referred to by several of the older writers, was brought out in a striking manner by the figures on which my lectures were based. In 11 of the 23 Montreal cases the disease came on with lobar pneumonia, while it developed with this disease in 54 of the 209 cases analyzed—indeed, the endocarditis which occurs in pneumonia seems to be of an unusually malignant type, as in 16 cases of my 100 autopsies in this disease in which this lesion was present, 11 were of this form. Meningitis was associated with endocarditis in 25 of the 209 cases, and in 15 there was also pneumonia.

The affection may complicate erysipelas, septicæmia (from whatever cause), and puerperal fever and gonorrhœa. Malignant endocarditis is very rare in tuberculosis, typhoid fever, and diphtheria.

It has been stated by many writers that endocarditis occurs in ague. With the unusual facilities for the study of this disease which I have had in the past seven years I have not yet met with an instance. Unquestionably, in the majority of these cases, the intermittent pyrexia, which has been regarded as characteristic of the ague, has depended upon the endocarditis. In dysentery cases have been described. In small-pox and scarlet fever, with which simple endocarditis is not infrequently complicated, the malignant form is extremely rare.

Morbid Anatomy.—The lesions may be either vegetative, ulcerative, or suppurative, and these forms may occur alone or in combination. Even with vegetations there is distinct necrosis and loss of the endocardial substance. More frequently there is ulceration, either superficial, involving only the endocardium, or deep and distinct, leading to perforation of a valve, of a septum, or even of the heart itself. In the suppurative form the deeper tissues of the valve appear first affected and small abscesses are found at the bases of the vegetations. The vegetations may present a remarkable greenish-gray or greenish-yellow color, and when of long stand-

ing, or even in cases which from the clinical history appear to be tolerably acute, the vegetations may be crusted with lime salts.

A large vegetation of malignant endocarditis consists histologically of a granular and fibrillated fibrin, colonies of micro-organisms, and distinct granulation tissue at the base, while the subjacent endocardial layers show infiltration and proliferation. The destruction of tissue results from a gradual extension of the necrotic processes. Various micro-organisms have been found in connection with the disease, and the following brief statement may be made with reference to them: In a large proportion of the cases streptococci and staphylococci are found. The pneumococcus has been cultivated from the vegetations in pneumonia. Other forms have occasionally been met with.

The following figures, taken from my Gulstonian lectures at the Royal College of Physicians, give an approximate estimate of the frequency with which in 209 cases different parts of the heart were affected: Aortic and mitral valves together, 41; aortic valves alone, 53; mitral valves alone, 77; tricuspid in 19; the pulmonary valves in 15; and the heart wall in 33. In 9 instances the right heart alone was involved.

Mural endocarditis is seen most often at the upper part of the septum of the left ventricle. Next in order is the endocarditis of the left auricle on the postero-external wall. The ulcerative changes may lead to perforation of a valve segment, erosion of the chordæ tendineæ, perforation of the septum, or even of the heart itself. A common result of the ulceration is the production of valvular aneurism. In three fourths of the cases the affected valves present old sclerotic changes. The process may extend to the aorta, producing, as in one of my cases, extensive endarteritis with multiple acute aneurisms.

The associated pathological changes are partly those of the primary disease to which the endocarditis is secondary and partly those due to embolism. In the endocarditis of septic processes there is the local lesion —an acute necrosis, a suppurative wound, or puerperal disease. In many cases the lesions are those of pneumonia, rheumatism, or other febrile processes. The changes due to embolism constitute the most striking features, but it is remarkable that in some instances, even with endocarditis of a markedly ulcerative character, there may be no trace of embolic processes.

The infarcts may be few in number—only one or two, perhaps, in the spleen or kidney—or they may exist in hundreds throughout the various parts of the body. They may present the ordinary appearance of red or white infarcts of a suppurative character. They are most common in the spleen and kidneys, though they may be numerous in the brain, and in many cases are very abundant in the intestines. In right-sided endocarditis there may be infarcts in the lungs. In many of the cases there are innumerable miliary abscesses. Acute suppurative meningitis was met with in 5 of 23 of the Montreal cases, and in over ten per cent of the 209 cases analyzed in the literature. Acute suppurative parotitis also may occur.

Symptoms.—It is difficult to give a satisfactory clinical picture of the disease because the modes of onset are so varied and the symptoms so diverse. Arising in the course of some other disease, there may be simply an intensification of the fever or a change in its character. In a majority of the cases there are present certain general features, such as irregular pyrexia, delirium, sweating, gradual failure of strength.

Embolic processes may give special characters, such as delirium, coma or paralysis from involvement of the brain or its membranes, pain in the sides and local peritonitis from infarction of the spleen, bloody urine from implication of the kidneys, impaired vision from retinal hæmorrhage, and suppuration, and even gangrene, in various parts from the distribution of the emboli.

Two special types of the disease have been recognized—the septic or pyæmic and the typhoid. Other cases closely resemble true intermittent fever. In some the cardiac symptoms are most prominent, while in others again the main symptoms may be those of an acute affection of the cerebro-spinal system.

The *septic type* is met with usually in connection with an external wound, the puerperal process, or an acute necrosis. There are rigors, sweats, irregular fevers, and all of the signs of septic infection. The heart symptoms may be completely masked by the general condition, and attention called to them only on the occurrence of embolism. In a most remarkable sub-group of this type the disease may simulate a quotidian or a tertian ague. The symptoms may develop in persons with chronic heart-disease without any external lesions. These cases may be much prolonged —for three or four months, or even longer, as in a case of Bristowe's. The existence in some of these instances of a previous genuine malaria has been a very puzzling circumstance.

The *typhoid type* is by far the most common and is characterized by an irregular temperature, early prostration, delirium, somnolence, and coma, relaxed bowels, sweating, which may be of a most drenching character, petechial and other rashes, and occasionally parotitis. The heart symptoms may be completely overlooked, and in some intances the most careful examination has failed to discover a murmur.

Under the *cardiac group*, as suggested by Bramwell, may be considered those cases in which patients with chronic valve disease are attacked with marked fever and evidence of recent endocarditis. Many such cases present symptoms of the pyæmic and typhoid character and may run a most acute course. In others the process is less intense and the course more chronic, lasting for weeks or months, so that the term acute is scarcely applicable to them. In a case of this kind under the care of Mullin, of Hamilton, the irregular fever lasted for more than a year. The autopsy showed extensive vegetative and ulcerative disease of the mitral valves.