

TYSON (J.)

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PENNSYLVANIA.



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GENTLEMEN: The patient whom I present to-day is one of a class which unfortunately, often necessarily through difficulty of diagnosis, is recognized for the first time on the necropsy table. It is the case of a young girl, aged seventeen when first admitted to the hospital, December 7, 1893. She was born in Pennsylvania, and had been living at service previous to admission. Her family history is negative.

She has had the usual diseases of childhood, and when about eight years old had inflammatory rheumatism, and from that time has never been perfectly well. She says that every winter since she has had a return of rheumatism, and has been treated for heart-trouble more or less ever since her first attack. In the winter of 1892-93, after recovering from an attack of rheumatism and returning to work, she found that she had loss of power in the left arm and leg. On admission she complained of shortness of breath and a sense of tightness across the chest. She could not sleep lying down, because of palpitation and a feeling of suffocation. There was no edema of the feet or legs. There was evident loss of power in the left arm and leg, but sensation was unimpaired.

On physical examination, inspection noted a diffuse impulse in the neighborhood of the sixth interspace in



the left mid-clavicular line; also a marked pulsation in the suprasternal notch. To palpation the apex-beat was found in the sixth interspace in the mid-clavicular line, strong and forcible, felt as far around as the anterior fold of the axilla. The impulse seen in the suprasternal notch was forcible to palpation, and a feeble thrill was felt at about the second interspace on the left side, and in the supra-sternal notch.

Percussion elicited relative dulness to the left of the sternum above the second cartilage as far as the parasternal line, and was succeeded by positive dulness at the third rib. The right border of the heart was found at the right edge of the sternum. Over the sternal region there was dulness from the second rib downward. Auscultation recognized a loud, rough steam-tug murmur, loudest at the second interspace on the right side, the systolic element conducted into the neck, both murmurs downward along the left of the sternum, the diastolic louder, and toward the apex. Both were, however, lost before the apex was reached, while at the apex itself appeared a loud systolic murmur, conducted very strongly into the axilla, and heard also at the angle of the scapula.

The pulse on admission was 90; respirations, 25; temperature, 99° F., essentially normal. The urine-examination found the specific gravity 1030; reaction acid; albumin, a small amount, but no tube-casts.

On further examination of the left arm and leg there was found to be no atrophy, and when asked to describe the condition herself the patient said: "When the left leg is drawn up it seems heavy; the same is true of the left arm." Moreover, she could not raise her left arm to comb her hair. When she walked the left toe continued to touch the ground after it should have been above it. The loss of power followed an attack of rheumatism, during which she was confined to bed. She had been working, however, over a month after the attack before

she noticed the loss of power, and while she seems to think it came on gradually, it is more than likely that it was sudden. The tendon-reflexes show marked increase, on the left more than on the right; and the slightest tap upon the radius or ulna produced intense reaction. There was, however, no ankle-clonus. She remained in the hospital until about the first of June, improving slowly, but always very nervous, excitable, and restless. Pulse-tracings made at different times during her residence in the house furnish typical tracings of aortic regurgitation. The diagnosis was aortic stenosis with regurgitation. Her temperature throughout her stay was normal, except for temporary and explainable causes.

She was readmitted on the 11th of October, 1894, with a report that she had been miserable all summer, and gradually getting weaker. About three weeks before admission she commenced to have chills, followed by fever and sweats. This occurred every day, the chill beginning in the afternoon; the fever reaching its acme in the evening. In the morning she sometimes felt warm, and was always very short of breath. She said her legs had been more or less swollen all summer, the left more than the right; that she had more or less rheumatism, which also seems to have been worse on the left side. Her left arm was still almost useless, and she complained much of pain in her left thigh and ankle. There was also great shortness of breath.

Blood-examination showed hemoglobin 45 per cent.; corpuscles, 2,880,000 in each cubic millimeter.

On the day of her readmission, October 11th, at 3 P.M., her temperature was 105.6° ; her respirations, 32; her pulse, 120. At 8 P.M. of the same evening, her temperature was 97.6° ; her respirations, 24; and her pulse, 74. At 4 A.M. the next day her temperature was 102° , and fell by 8 A.M. to 99.4° . A similar rise occurred at 8 P.M. of the 12th, followed by a fall to 99.6° by 4 A.M. the next morning.

Reëxamination of her heart recognized very much the same condition of physical signs as at her discharge, except that there was further enlargement to the right, and a double mitral murmur instead of the single murmur in the mitral area present at her first admission. Thus the signs now pointed to double mitral disease, as well as double aortic disease.

This extraordinary history of daily chill, fever, and sweats, with the signs of valvular disease, at once suggested the possibility of malignant endocarditis, and we sought at once to eliminate other possible causes of symptoms so marked and striking. Accordingly, her blood was exhaustively examined by Dr. Daland and ourselves without finding any malarial organisms. She was at the same time placed upon full doses of quinin, twenty grains a day, for a number of days in succession, without producing any effect upon the chills and fever. These continued daily, and there would be at times two periods of acme in the twenty-four hours, with this further feature that the maximum might be noted at four o'clock A.M. one day, and again at four o'clock P.M. the same day, with an intervening fall. Still, on the whole, it seemed that the highest temperature was reached more frequently during the latter part of the day. At this time, also, her blood was examined microscopically by Dr. Abbott and Dr. Ravenel, of the Laboratory of Hygiene, for micrococci, with negative results, while cultures also made at the same time remained sterile.

Reëxamination of the chest, on the 25th of October, 1894, noted a decided dulness from the ninth interspace downward to the edge of the thorax and below posteriorly to the spinal column, and anteriorly to the mid-clavicular line. There was also absence of breath-sounds in the same locality, and an absence of vocal fremitus; though it was noted, also, that there was little or no fremitus on the opposite side. With a view to determining whether this dulness was due to an enlarged

spleen or a pleuritic effusion, a small trocar and canula of an aspirating apparatus were introduced a few days later in the ninth interspace just within the line of the angle of the scapula, with negative results. We concluded, therefore, that the enlargement was splenic, and probably due to embolism.

The patient's strength is rapidly succumbing to the exhaustive effects of the fever and the virulence of the poison. She is growing rapidly weaker, is anemic, almost bloodless in appearance, while the temperature-range has become even more marked and astounding, as revealed by the appended drawing of the temperature-chart.

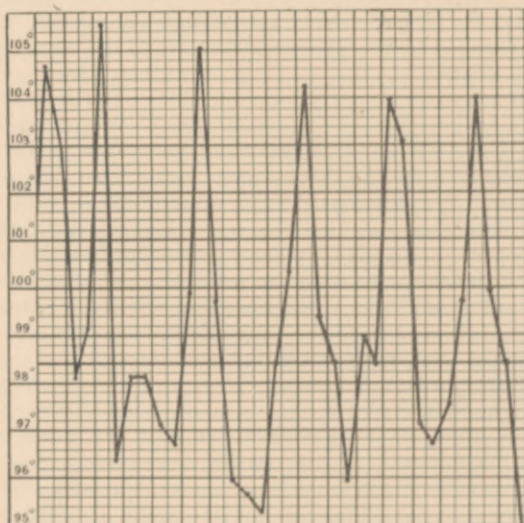
It will be observed, for example, that at 10 P.M. of the 8th of November the temperature reached 105.4° , while y 4 A.M. the next morning it had fallen as low as 96.2° , a drop of 9.2° . By 6 P.M. it had again risen to 105° , followed by a fall to 95.2° at 4 A.M., or 9° in ten hours.

On the next day after the exploratory tapping there was a sharp pain in the abdomen, succeeded by diarrhea, which we suspected to be the result of another embolus lodged in some one of the intestinal bloodvessels, contributing, perhaps, to the extraordinary increase of the range of temperature noted.

For some days previously to November 13th there had been a small amount of albumin in the patient's urine and a few pale granular tube-casts. On this day, however, the albumin was found to be decidedly increased, and there were found in the urine numerous blood-discs and blood-casts, as well as pale granular casts. This was regarded as an indication that another infectious embolus had been shot off from the cardiac valves, and lodged this time in her kidney.

On the morning of November 14th, at seven o'clock, she called the nurse, and said that she could not move her right arm, and a few minutes later that she could not move her right leg; in a word, she was hemiplegic

on the right side, the opposite of the primary attack of hemiplegia already noted as occurring previously to her first admission to the hospital. She remained conscious, and in the course of two hours there was complete return of motor power on the right side. The embolus was evidently small, and obliterated a vessel of corresponding size, whence the circulation was speedily reestablished, and the hemiplegia was but transitory, while consciousness was not at all interfered with.



On the morning of the 15th two additional conditions presented themselves, also of great interest and importance. On her right hip was a large red blotch, nearly circular, two inches by two-and-a-half in diameter, evidently the seat of a blood-extravasation. Directly over the sacrum was another spot of the same size and char-

acter. This had occurred during the night, as at bedtime her skin was pure white and without a suggestion of discoloration. Evidently two emboli had been lodged in a bloodvessel of the skin, and the embolism was followed by the extravasation of blood beyond, constituting the well-known hemorrhagic infarct. During the next night another occurred in the same vicinity.

This history, including the chills, the marvellous temperature, the sweats, the signs of embolism in the brain, spleen, bowels, kidney, and skin, the rapidly growing anemia and general failure of health, in association with the signs of disease of both valves, admitted of but one conclusion, that the patient had mycotic or ulcerative endocarditis.

What, then, is mycotic endocarditis? It may be defined as an acute infectious fever due to invasion of the blood by a micro-organism and characterized anatomically by inflammation of the endocardium excited by the same organism. The disease itself has not been very long separated from others of like symptoms, except so far as the malignant nature is concerned. It was recognized as a separate form of disease, however, in 1851, by Senhouse Kirkes, though its mycotic nature was not discovered until comparatively recently, since Koch made his extraordinary discovery of the bacillus of tuberculosis.

I prefer the term mycotic endocarditis to any of the somewhat numerous others suggested, including ulcerative endocarditis, malignant endocarditis, infectious and diphtheric endocarditis, because it indicates the origin and nature of the disease better than any other, though the term malignant endocarditis, preferred by many, certainly gives a more accurate picture of the chief clinical features of the disease.

In the present instance the diagnosis is comparatively easy, because we have the history of a previous chronic endocarditis; and given such an endocarditis, with the

supervention of the symptoms described and the elimination of a possible malarial cause, the diagnosis is at once apparent. The aid furnished by the preëxisting cardiac disease is not, however, always present. In a few instances the disease originates *de novo*, without the discovery of a previous cause or concurrent disease, constituting thus a true primary mycotic endocarditis. Fortunately, in the majority of cases, there is a concurrent infectious disease, which probably furnishes the infecting bacterium. Of such diseases pneumonia is the most frequent. The disease occurs also in association with gonorrhœa, rheumatism, pleurisy, puerperal fever, bone-necrosis, and septicemia from any cause. More rarely it has been found in connection with meningitis, small-pox, diphtheria, scarlet fever, tuberculosis, and dysentery. The micro-organism that is directly responsible for the disease is usually that of the infectious disease responsible for the endocarditis. Most frequently, perhaps, it is the lancet-shaped bacillus of pneumonia, after this pus-organisms, the streptococcus and staphylococcus.

As to the acute cardiac lesions associated we find, in addition to the old sclerosis, three sets—vegetative, ulcerative, and suppurative. The vegetative are for the most part made up of closely packed spherical micrococci more or less commingled with small fibrin-masses. The vegetations vary in size from that of a pin's head to a pea, and are reddish-yellow in color. The seat of this vegetation becomes rapidly necrotic and breaks down into an ulcer which may perforate the valve, with or without previous protrusion, constituting in the latter event the so-called valvular aneurysm. More rarely minute foci of pus are found in the deeper tissues of the valve-leaflets. The invasion is, however, not always confined to the valves of the heart, but may extend to the mural endocardium. Of the valves the mitral is most frequently involved; next the aortic; next both mitral and aortic jointly; next the lining of the heart-wall;

next the tricuspid, and last the pulmonary valve. In a few instances the right heart alone is invaded. Other morbid changes include the lesions of the concurrent affection and the phenomena of embolism due to lodgment of fragments of vegetation. The resultant when complete is a metastatic abscess, though the earlier stages of red infarction may also be present. On the other hand, embolism is not invariable. It may be totally absent.

In this particular case we have had, however, a number of embolic lodgments, the first being that noted as occurring before admission and before the endocarditis had become malignant. You will remember that a part of the symptomatology narrated was, in addition to the left hemiplegia, a decided increase in the tendon-reflexes. We may pause for a moment, with advantage, to consider the explanation of this interesting phenomenon. The lodgment referred to evidently took place in the cortical motor area, in which is also seated an inhibitory control over the tendon and muscle reflexes, by means of which they are kept within bounds. The effect of the lesion was to destroy this inhibition, and the reins were, so to speak, let loose upon the reflexes, which became unmanageable and were increased to such degree that the slightest tap on the radius or ulna caused a very prompt flexion of the forearm on the arm or the periosteal reflex.

Of the embolisms which occurred subsequently to the invasion of the malignant form of endocarditis upon the simple form, the first we could definitely locate occurred in the spleen, resulting in the enlargement and tenderness already noted as present. A day or two later the event of a sharp abdominal pain, followed very closely by diarrhea, led us to believe that there was embolism of one of the intestinal bloodvessels. Next came the embolism of the kidney, as the result of which there appeared in the urine an increased amount of al-

bumin, blood-corpuscles, and blood-casts, without, however, pain, which sometimes occurs in connection with renal embolism. Then we had the second cerebral embolism, slight in degree and temporary in the duration of its effects, occurring on the morning of the 14th; and finally the cutaneous embolisms just described as having happened some time during the night of the 14th and 15th.

In addition to these seats of embolic lodgment we may have also embolism and hemorrhagic infarct occurring in the lungs from emboli starting in the right heart, while those starting from the left heart are found in the systemic organs. The number of embolisms varies greatly in these cases. It has been already said that they may be altogether absent, while they may be counted by hundreds, in which event they are, of course very small.

It is not often that we have so strikingly present the symptoms of ulcerative endocarditis shown by this case, and which make the diagnosis in this instance comparatively easy. It will be remembered that we had here a primary chronic valvular heart-disease, which at once suggests the invasion of the malignant form, if the chill and fever so irregular in type are added. Given, however, a pneumonia, a pleurisy, the puerperal process, and the supervention of a similar set of symptoms, this form of heart-disease should be immediately thought of and the heart carefully examined for the auscultatory signs of endocarditis. In the primary forms, though rare, we have not even the presence of one of the diseases named to suggest the occurrence of ulcerative endocarditis. Here the resemblance to intermittent fever is even more close, but a careful study of the temperature-chart from day to day, and above all the utter failure of the antiperiodic remedy to produce any effect, will in a short time show that the malarial disease is not present. I do not doubt, however, that very many times has the malady under con-

sideration been mistaken for intermittent fever, and with reason, for many a case of irregular quotidian and tertian fever presents symptoms not more diagnostic. It always greatly aids the diagnosis when to these are added other symptoms suggesting the embolism which so frequently occurs. And the occurrence of a hemiplegia or pain in the region of the spleen, with increased dulness on percussion, or pain in the region of the kidney, with hematuria, or a sudden blotch in the skin of the kind described, is of inestimable importance in aiding the diagnosis. More rare symptoms of similar origin are impaired vision from retinal hemorrhage, parotiditis, and abscess of the parotid gland.

A further study of the symptoms of malignant endocarditis permits their classification into four groups, known as the *septic*, the *typhoid*, the *cardiac*, and the *cerebral*.

The *septic* type occurs in connection with septic processes, an external wound, the puerperal process, or acute bone-disease with necrosis. The symptoms added are rigors, irregular fevers, and sweats. Yet these are only the symptoms characteristic of pyemia. In fact, it is a pyemia; and the term arterial pyemia, suggested by Wilkes, is a good one, because the pyemic abscesses are the result of embolism, whose emboli start in the left heart and lodge in the arteries. The presence of the endocarditis constitutes a distinct feature of the disease, but its symptoms may be masked, though careful examination of the heart will generally furnish its signs. The resemblance to intermittent fever here exists also, and a quotidian or double tertian type may be simulated, or the symptoms may develop in persons with chronic heart-disease without external symptoms.

The symptoms of the *typhoid* type are even more characteristic. There are here too the same prostration, irregular temperature, and sweating; but rigors are less frequent, while the onset is more gradual. There are

delirium, drowsiness, often looseness of the bowels, with distention of the abdomen and tenderness in the right iliac region, to which also a rash may be added, which, though not identical with that of typhoid fever, is nevertheless similar to it. The tongue is dry and brown, and sordes collects about the teeth. The temperature is remittent, like that of typhoid, reaching 103° and 104° F., and even higher. Here again the heart-symptoms may be overlooked.

In the *cardiac* type are included those cases in which there has been chronic valvular disease, on which has supervened fever, with rigors and sweats, and the symptoms of embolism described as having occurred in the present case.

The symptoms are not always as pointed as detailed, while they may include others not mentioned. The fever may not be as high, but it is always present; again, it may not be remittent, but continuous. There may be jaundice, precordial oppression, shortness of breath, while heart-symptoms may be altogether absent, when it is almost impossible to make the diagnosis or to distinguish the disease from a septic fever of the ordinary kind. The pulse and respirations are invariably accelerated. Albuminuria and casts occur in all forms, either as the result of acute nephritis or of renal embolism.

If there is anything peculiar about the physical signs, it is their want of definiteness. When murmurs are present it is often difficult to locate or time them precisely. They often vary from day to day. They may occur at both base and apex, and with reason, for both sets of valves may be and often are involved. The super-addition of pericarditis adds a further source of confusion in the friction-sound superadded.

Still another group is the *cerebral*, in which the symptoms simulate meningitis, basilar or cerebro-spinal, and acute delirium may be present, in marked contrast to

the mental state of our patient, whose mind is very clear.

As to complications, these are mainly the original cardiac disease and the diseases that most frequently cause the mycotic inflammation. Pericarditis and pleurisy are frequent complications in the strict sense of the term. So is meningitis. Acute nephritis, the result of the poison of the microbe circulating in the blood and independent of embolism may be present, with all the characteristic symptoms, blood-casts, free blood-corpuscles, and pronounced albuminuria. Gastro-intestinal derangements are sometimes conspicuous when not of embolic origin. Diarrhea was especially troublesome in our patient.

The *diagnosis* is easy only in the cardiac group. A few days' study of the temperature, with its extreme fluctuations, the rigors and supervening sweats, should at once lead to suspicion, and these, if continued, mean only one thing. The other forms are not so easily recognized; but if one would always remember the possibility of the occurrence of malignant endocarditis in connection with the diseases named, it would be less frequently overlooked. The presence of concurrent disease should guard us against the conclusion that there is typhoid or rheumatic fever. Septic fever is essentially the same in all cases, the heart-symptoms adding the only peculiarity. In true typhoid fever there is always splenic enlargement and often parotiditis, so that the presence of these symptoms naturally suggests that disease, and an erroneous diagnosis is not inexcusable. It is said that splenic enlargement is not so marked as in typhoid fever, but in my experience it is quite as conspicuous, but there is commonly more tenderness in mycotic endocarditis. Rheumatic fever often more closely resembles malignant endocarditis, with its high irregular fever and copious sweats, while confusion is further contributed to by the fact

that endocarditis is one of rheumatism's most frequent complications, the mycotic form being a possible though a rare instance. The joint-symptoms of rheumatism are, however, more conspicuous at an early stage of the disease, and recurring rigors are not usual in rheumatism; but there is no enlargement of the spleen, nor are there symptoms ascribable to embolism unless secondary to endocarditis. The ultimate failure of remedies in the malignant form settles the question. The essential identity of ordinary pyemia and malignant endocarditis has been mentioned, and only the endocarditis and its consequences, which make it different from ordinary septic fever, can suggest the true nature of the sepsis.

The prognosis is always unfavorable, though the disease may be prolonged for many weeks and even months. Usually, however, five or six cover its course, while some cases are of shorter duration. Eberth reports one fatal in two days.

Treatment unfortunately avails little. The patient should be kept at rest. Remedies should be restorative and supporting—quinin, stimulants, digitalis. Nourishing food is indicated. The high temperature may be treated by sponging or by an ice-cap or by Leiter's coils applied to the thorax or abdomen; but it is seldom of so long duration as to require special treatment.

AUTOPSY AND COMMENTS THEREON.

A few days after the foregoing lecture was delivered the patient died, and an autopsy was secured. The diagnosis was fully confirmed in the finding of a greatly hypertrophied heart, whose valves, both aortic and mitral, were richly beset with characteristic vegetations, the aortic lunulæ being further eroded to nearly half their extent. The kidney and spleen, on the other hand, presented lesions which, while not identical with those foretold in the lecture, were still of a kind consistent with the primary conditions and most interesting and instructive.

The kidneys, instead of being the seat of embolism as expected, because of the sudden hematuria, blood-casts, and increased albuminuria, were found to be the seat of a typical acute hemorrhagic nephritis, a frequent complication and the direct result of the action of the infectious organisms. The spleen contained four hemorrhagic infarcts; yet these were all old, being opaque, white, and much reduced in size, and could not, therefore, have been responsible for the acute enlargement of the spleen recognized before death and found at autopsy. The organ weighed 480 grams and presented on section an intensely bright-red surface on which stood out with distinctness the white dot-like Malpighian bodies, easily visible to the naked eye. The liver was much enlarged, weighing 1700 grams. The brain was not examined.

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