EXTRACT FROM A LECTURE ON THE MORBID ANATOMY OF ACUTE ENDOCARDITIS.

By GEORGE JOHNSON, M.D., F.R.C.P.,

Physician to King's College Hospital; Professor of Medicine in King's College,
London; etc.

I WILL now describe and explain to you the anatomical characters of acute endocarditis.

The lining membrane of the heart, when inflamed, becomes red, either uniformly or in patches. The surface, deprived of its natural polish, feels more or less rough. The membrane becomes opaque, thick, and soft, and can be stripped or scraped off in patches; its tissue sometimes cracks, and then fibrinous coagula form on the margins of the resulting fissures.

Fibrinous concretions or wart-like vegetations form on the free surface of the membrane, sometimes in patches, here and there, in the interior of the auricle or ventricle; more commonly on the mitral or aortic valves; much less frequently on the tricuspid valves; with extreme rarity, if ever, on the pulmonary valves. These fibrinous vegetations are often scattered over the surface of the valves, both mitral and aortic; but they are commonly most abundant near the *margins* of the valves, forming bead-like fringes on the margins of the mitral valve, and often, as Sir Thomas Watson particularly points out, a double festoon on each semilunar valve, the fibrine being collected most abundantly at the line of junction between the thinner and thicker portions of the valve.

It should be observed that the vegetations are usually confined to the *under* or cardiac aspect of the aortic valves, and that they rarely occur on the upper or arterial surface. I will presently give you what seems to be the explanation of this fact.

Sometimes, though rarely, rheumatic inflammation leads to *ulceration* and *destruction* of one or more of the semilunar valves. The ulcerative process may extend into the contiguous muscular tissue, and it may even go so far as to perforate the septum of the heart. Sir Thomas Watson relates one case in which this occurred, and another in which an abscess as large as a hazel-nut had formed in the septum immediately opposite the disorganised valve. The hearts of these two patients are on the table. Both patients were young women—one aged 21, the other 22. Both were admitted for a first attack of rheumatic fever. Both had acute pleurisy, and endocarditis, without pericarditis. One died in three weeks; the other, a month after admission.

Sometimes large and firm coagula are found in the cavity of the auricle or ventricle.

One of the accidents of endocarditis is the rupture of one or more tendinous cords of the mitral valve, rendered brittle by the inflammatory process. The broken ends of the cords then become covered by warty vegetations.

Some interesting questions relating to the morbid anatomy of endocarditis we will consider now, before passing on to the symptoms.

1. Why are the morbid changes so often limited to the *left side* of the heart? To this question the reply is, that arterial blood probably contains the morbid element of acute rheumatism, which is the most frequent cause of endocarditis, more abundantly than does the venous blood; and the morbid arterial blood, by its contact with the endocardium of the left cavities, acts as an irritant, and thus excites inflammation. An experiment of Dr. Richardson's affords support to this explanation. He injects a solution of lactic acid into the peritoneum of a dog. The result is endocarditis, with fibrous deposit on the *tricuspid valve*. The acid absorbed by the veins first comes into contact with the right side of the heart, and there excites disease; and a bellows-sound is heard on auscultation over the heart.

2. What is the origin of the fibrinous vegetations? Why are they so often found on the valves alone? and why especially on the margins of the valves? Some pathologists, and amongst others Mr. Simon (*Lectures on Pathology*, p. 55), deny that these vegetations are of inflammatory origin. Mr. Simon's theory is, that they are fibrinous precipitations from an overcharged solution of fibrine; the valves encrusting themselves with fibrine, just as a stick in certain streams coats itself with a calcareous envelope. And he explains the preference of these vegetations for the left side of the heart by the fact that arterial blood is more prone than venous blood to precipitate its fibrine, either from containing more of it, or from containing it in some more separable form. Mr.

Simon supports his theory by the results of experiment. By means of a very fine needle, he passed a thread transversely through the artery and vein of a living dog, leaving it there, so that it might cut the stream. The thread was allowed to remain during a period of from twelve to twenty-four hours. The vessels experimented on were the femorals, the carotid and jugular, the aorta and cava, in different animals. The result was, that the thread, where it traversed the artery, presented a considerable vegetation on its surface, sometimes as large as a grain of wheat, always of pyramidal shape—its base attached to the string; its apex in the direction of the blood-current. Mr. Simon remarks upon this: "In the artery, one might say that the thread whipped the blood, just as one whips blood in a basin to get the fibrine out of it; but with this trifling difference, that, instead of the rod beating the fluid, the fluid ran over the rod, and precipitated its fibrine there." In the vein, the thread seemed to operate only obstructively, never coating itself with fibrine, but sometimes delaying or stopping the circulation with a voluminous black clot, chiefly collected on that side of the thread most remote from the heart.

Mr. Simon's theory, supported as it is by his ingenious experiments, contains a very important element of truth; but it is not the whole truth with regard to the pathology of endocarditis. I feel sure that he is right in his opinion that the fibrinous vegetations are chiefly, if not entirely, a deposit from the blood, and not solely or chiefly an exudation from the inflamed lining membrane of the heart. Admitting with Mr. Simon that acute rheumatism is a disease in which there is an excess of fibrine in the blood; in which, too, "almost certainly there are other conditions besides *quantity*, making the fibrine easy of precipitation" (p. 57)—I maintain that the *immediate cause of the fibrinous deposit, which constitutes the vegetations of endocarditis, is the altered physical condition of the lining membrane, which results from its being inflamed.*

There are facts and experiments which afford much support to this proposition. The fibrine of the blood has a tendency to coagulate on any parts of the interior of the vascular system which have become roughened or otherwise structurally changed. Thus, in the interior of an aneurism, the fine laminated coagula form layer after layer. In one series of experiments, designed by the late Dr. F. W. Mackenzie to illustrate the pathology of phlegmasia dolens, he first excluded the blood from the jugular vein of a living dog; then he irritated the lining membrane by the application of a solution of nitrate of silver. When the blood was readmitted, it speedily coagulated throughout the entire tract of the vein so treated." (*Medico-Chir. Trans.*, vol. xxxvi, p. 201.) This affords a striking illustration of the influence exerted by inflammation of the lining membrane of the vascular system in causing coagulation of the blood.

In Mr. Lister's Croonian Lecture on the Coagulation of the Blood, he adduces facts and arguments in opposition to the theory that ammonia is the essential cause of the blood's fluidity, and shows that the contact of a foreign body will determine the coagulation of the blood when the escape of ammonia would have been impossible. Thus blood coagulates on a coil of wire in the carotid of a horse. It coagulates in capillary tubes immersed in ammonia. He also found that blood coagulated on parts of vessels which had been inflamed by contact with ammonia.

The explanation of the fibrinous vegetations, therefore, appears to be this. The endocardium is inflamed and thickened, and its surface consequently roughened by exudation. Upon the surface so roughened, the fibrine becomes deposited, and agglutinates in wart-like masses. The valves are a favourite seat of these fibrinous deposits from the blood, because their streamward surfaces and their margins are continually exposed to the friction of the blood-current; so that, if the whole interior of the ventricle and the surfaces of the valves were uniformly inflamed and roughened by exudation, the vegetations would be more abundant over the valves, on account of the mechanical facilities which there exist for the coagulation and deposit of the fibrine.

If, as I have before suggested, the contact of the morbid blood with the endocardium is the exciting cause of the inflammation, it is obvious that the orifices of the heart and the valves, in proportion as they are more exposed to this morbid influence than the general surface of the cavities of the heart, are in the same degree more liable to be the seats of inflammation.

Sir Thomas Watson explains the double festoon of fibrine on each semilunar valve by supposing that the exuded lymph is mechanically pressed away from the thinner portions of each valve, where the two surfaces come into contact when the valves are closed; and consequently the lymph is "heaped up in a ridge along the boundary lines of contact, just as a thin layer of butter on a board would be displaced and heaped up in a little curvilinear ridge by the pressure of one's thumb." It is probable that a deposit on the under or cardiac aspect of the thinner margins of the valves might be displaced by the pressure of

the opposed surfaces; but this theory does not explain the absence of fibrinous deposits on the upper or arterial aspect of the valves. I believe that the distribution of the fibrinous vegetations on the semilunar valves is explained by the fact that the thicker, fibrous, and more rigid portion of each valve has its margin and its cardiac surface projected against the onward current of blood, and thus receives a more abundant deposit of fibrine.

My explanation of the fibrinous vegetations is essentially the same as that given by Rokitsky (*Pathological Anatomy*, vol. iv, p. 222), who says that, in the great majority of cases, the vegetations are only in part to be regarded as inflammatory products. The lowest layer alone can be considered as an exudation; whilst the greater number have been formed in a secondary manner by a deposit of fibrine from the blood.

As fibrine is thus deposited upon surfaces roughened and structurally changed by inflammation, so in like manner fibrinous vegetations are apt to occur on the margins of any fissure of the endocardium, on the torn extremities of a papillary tendon, on the margin of an acute aneurism of the heart, on the inner wall of a chronic aneurism of the heart, and, beyond the heart, on rough and uneven spots on the inner surface of the vessels. In each of these cases, the deposit of fibrine is determined by the blood coming into contact with an abnormal surface.

Sir Thomas Watson mentions a curious fact which bears upon this subject. In one of Dr. Hope's experiments, performed with the view of ascertaining the cause of the second sound of the heart, the aortic valves of an ass were held back by a wire passed into the vessel. The animal had previously been rendered insensible by a narcotic, and the circulation was kept up by artificial respiration. Upon the final cessation of the heart's motions, the organ was removed from the body, and examined; when the valve that had been mechanically injured was found studded with wart-like masses of fibrine. The brief duration of this experiment precludes the possibility of an inflammatory exudation. It is manifest that the mechanical injury of the surface of the valve had the same influence in causing a deposit of fibrine, as the inflamed membrane has in the case of endocarditis.

The facts to which I have referred indicate with sufficient clearness the manner in which warty vegetations are formed during the progress of acute endocarditis. The lining membrane of the heart is physically changed by the inflammatory process; and, as a result of this, fibrine is deposited upon the altered surface, as it is deposited upon a foreign body, such as a thread or a wire, introduced within the vessels; and the fibrine is deposited most abundantly on those parts of the interior of the heart which, being inflamed, are also most exposed to the friction of the stream of blood, especially the margins of the valves and their streamward surfaces.

A knowledge of the fact that these wart-like masses of fibrine are mechanical deposits from the blood, having no organic union with each other or with the tissues beneath, renders intelligible the readiness with which the fibrinous concretions become detached from the valves, and carried away with the stream of blood, thus giving rise to the various phenomena of embolism.

ON THE TREATMENT OF CERTAIN FORMS OF UTERINE CANCER.*

By C. H. F. ROUTH, M.D.,

Senior Physician to the Samaritan Free Hospital for Diseases of Women and Children; Consulting Physician for Diseases of Women to the West London Hospital for Diseases of the Chest; etc.

CASE IV. Fibro-carcinoma of Anterior Os; Removal by Ecraseur; Subsequent Destruction by Bromine; Apparent Recovery.—E. E., aged 43, married, was admitted under my care on July 29th, 1868. She had had two children, the oldest sixteen years old. She had been ill twelve months, and had been subject to bleeding for several years; but last year had a flooding every three months, lasting a week. The clots were sometimes very red, and at other times quite black. She looked very anæmic. She was not aware that any of her relatives suffered from similar womb-disease or breast-complaints. The catamenia began at 12, and had been regular from that period, and always painless. It was the loss of blood which made her apply for medical attendance.

Examination.—The uterus was freely moveable. The sound penetrated to the normal distance, but was followed by blood. The anterior os was prolonged to the size of a fig. Felt inferiorly, it appeared as if it were a polypus projecting from the os; but superiorly it was continuous with the uterine substance. The inferior os was rough and irregular. Examined by the speculum, it was found very vascular, of a

bluish colour, and covered with vessels. It had very much the appearance of fungus hæmatodes.

On consultation with Drs. Savage and Rogers, it was decided to use first the *écraseur*, and then bromine. Brandy and an acid mixture were freely given. The hæmorrhage after the use of the *écraseur* was very great; and solution of persulphate of iron had to be freely used, which led at first to considerable contraction of the canal. When the bromine was about to be applied, the catamenia came on. It was subsequently used, however, when this ceased. The pain produced by it for several hours was so intense, that it had to be removed. It was applied twice, and the parts assumed a healthy state when the sloughs came away. The mucous membrane healed over, and she left the hospital apparently cured.

CASE V. Fibro-carcinoma of Inferior Os, with probable Syphilitic Taint, of several Years' Duration; Removal by Ecraseur; Subsequent Destruction by Bromine; Cure.—Mrs. P., aged 42, consulted me on July 9th, 1868. She had been married thirteen years. She had a miscarriage at first, then three healthy children, in 1857, '58, and '60. During the pregnancy of 1860, she had some external sores, which prevented her from sitting down comfortably. Poultices only were applied. The child was born healthy, but had an eruption on the pudenda three weeks after birth, and died in a month. She herself was afterwards attended for sores internally, said to be ulcers of the womb, for which caustic was applied. In about eight months afterwards, a baby was born at seven months; and she had three following successively "as quick as she could", at seven months. Two of these were born alive, but died almost directly. One was still-born, and was said to have been dead a fortnight; but she did not see it. She had a miscarriage three years ago, and again a few weeks since. In November 1867, she had a sore throat and several holes in the palate, so that she could scarcely speak; these lasted till May. She got better. She never knew that her husband had ever had any specific disease, or that she had caught anything in a dirty water-closet. Her husband, questioned privately and closely, admitted having had syphilis twenty years ago, but never since; and there seemed no room to doubt his story.

This lady was suffering with the usual uncomfortable sensations of womb-disease—backache; bearing-down pains; copious leucorrhœa, sometimes very offensive. On examination, the uterus was found large, heavy, more or less congested; and from the lower lip projected a growth very suspicious in appearance and very hard, continuous with the lower lip, and apparently extending into the uterine substance. After some days, I removed this growth with the *écraseur*; and applied, as soon as I could, the bromine several times. The ulcer produced would not heal, and occasionally exuded offensive discharges, bleeding freely on touch, but having a hard base. After about six applications of the bromine in the course of two months, all followed by deep sloughs, I injected into the hardened base a solution of bromine. It gave intense pain; but, when the slough came away, the excavated ulcer healed readily, and she made a perfect recovery. I have since learnt that she has had a healthy child.

The remedies used in this case were, first arsenic, then iron, and occasionally small doses of mercury. The latter was used to correct any remaining taint of syphilis, if present.

CASE VI. Cancer of Womb; Destruction by Bromine and Hydrofluoric Acid; Temporary Recovery.—F. E., aged 38, was admitted under my care on December 11th, 1867. She had been married nine years to her present husband; two years before, to another husband. She never was a very healthy person; never had any children. She had had hæmoptysis. She was now very weak and nervous; could not eat, but could drink port wine, which she thought had strengthened her. Menstruation had been regular up to the last three months; but it had since occurred on only one day at the utmost. On the 9th, she had great pains over the uterus and chest, and vomited a great deal of blood, which relieved her. Vomiting was not uncommon with her, but was not usually blood. For three months she had had a discharge, not at first offensive, but so now; it was sometimes bloody, and sometimes green. Dr. Wynn Williams, a week before her admission, diagnosed cancer. She had a sensation of quivering in the womb, and felt very weak. The catamenia were present. She was ordered quinine and perchloride of iron. On December 23rd, the catamenia having ceased, she was examined. The uterus was not fixed. The cervix was irregular, ulcerated, and jagged; it was hard, bleeding on touch. The odour was cancerous. Bromine was applied. On January 1st, 1868, the slough had not yet come away. She had very little pain. There was some discharge of sanious bloody pus. The odour was offensive. A weak bromine injection was used. On January 5th, there was improvement, and the bromine was again applied. On the 8th, the sloughs had all come away. The parts looked healthy. Patches of mucous

* Continued from page 204 of last number.