SIX CARDIAC AND VASCULAR CASES: WITH
REMARKS AND ENGRAVINGS.By EDWIN RICKARDS, M.A., M.D.,
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CASE II. *Communications between the Aorta and Pulmonary Artery and between the Left and Right Ventricles: two Aortic Segments.*—W. P., aged 30, married, with four children, was admitted into the General Hospital on September 24th, 1877. He had been in the hospital previously, in 1861, for a month, and was treated for rheumatism. None of his relatives were rheumatic. Except on the occasion referred to, he had never been off work through illness. He had, as long as he could remember, been subject to a feeling of discomfort about the chest, amounting occasionally to pain. He followed his employment, that of a brass-founder, with ease, until the beginning of April 1877, when he found himself becoming day by day short of breath. He worked on till September 19th, when his legs began to swell. On September 24th, he came to the hospital. He was then very pale; his legs were oedematous; the large arteries throbbed visibly; he had decided dyspnoea, and an occasional dry cough. He said his appetite was very good, and that he slept well. On examining his chest, his heart was found to be much enlarged, its area of dullness extending two inches to the right of the sternum; its impulse was heaving; its apex-beat three inches and a half below the left nipple. Two loud rough murmurs, systolic and diastolic, were heard over the front and back of the chest; the two murmurs seemed to run into one another, so as to constitute one continuous murmur; they had their maximum intensity over the sternum, between the third costal cartilages. The systolic murmur was the louder of the two; it was heard in the carotid arteries, and with diminished intensity at the apex of the heart. The diastolic murmur did not seem to be conducted in any particular direction. At the apex of the heart, though heard, it was subdued; in the carotid arteries, it was inaudible. Both murmurs were so loud that they could be heard distinctly through the bedclothes. Over an area of the size of the hand, in the cardiac region, was felt an intense vibration—a so-called purring tremor—which was double in character, and synchronous with the murmurs.

While he was in the hospital, oedema invaded his scrotum and trunk; his pallor increased; dyspnoea became great; he had epistaxis, pulmonary hæmorrhage, and congestion of the lungs. His urine averaged thirty-two ounces in twenty-four hours; specific gravity 1015; it contained a considerable quantity of albumen and hyaline casts. Pulse full, resilient, 100 per minute; its sphygmographic tracing was typical of aortic regurgitation with hypertrophy.

At first, he was treated by rest in bed, a milk-diet, and one drachm of infusion of digitalis every four hours. Two days after this treatment was commenced, his general symptoms were worse, and he had epistaxis and pulmonary hæmorrhage. Digitalis was then changed for two-grain doses of quinine three times a day. Subsequently he took a dry and generous diet, with stimulants. The latter treatment helped him considerably for a time. In November 1877, he died from oedema of the lungs.

POST MORTEM EXAMINATION.—The trunk and lower extremities were anasarctous. The serous cavities contained a considerable quantity of fluid. The liver weighed fifty-eight ounces. The spleen was enlarged, and its capsule thickened. The kidneys were small, granular, and contracted; the two weighed seven ounces. The microscope showed that the liver had undergone pigmentary degeneration, and that the kidneys were cirrhotic. The lungs were oedematous. The heart weighed twenty-three ounces; all its chambers were dilated, and their walls hypertrophied. The dilatation was greatly in excess of the hypertrophy. The auriculo-ventricular valves were free from disease. The aorta was dilated, and above its valve was sound. Its valve was constituted of two segments only. One was nearly twice the size of the other. Both were dilated and thickened, but were soft and membranous and perfect, and were on the same level. The larger segment represented the anterior and left posterior segments; the smaller one was the right posterior segment. The former, at its attached margin interiorly, had a ridge indicating an attempt at division; but its unattached margin showed no signs of the blending of two valves into one. There were two aortic sinuses corresponding in position and size to the two segments. The smaller one admitted two fingers; the larger one readily admitted three fingers. In the latter was an aperture of communication with the pulmonary artery, through which the little finger could be passed; it was circular, and the tissue forming it

was smooth, membranous, and funnel-shaped. In the septum ventriculorum, immediately below the larger segment, and encroaching on it, was an aperture through which the tip of the little finger could be passed into the right ventricle; this aperture was circular, and formed by smooth and membranous tissue. The pulmonary artery above its valve was sound, but dilated. The segments of its valve were free from disease; two of them were pushed asunder at their attached margins by the abnormal opening from the aorta. Immediately below this opening was the aperture in the septum. The engraving shows the two segments of the aortic valve. The probe A is placed in the communication between the aortic sinus and the pulmonary artery; the probe B in the aperture in the septum ventriculorum.

REMARKS.—In reviewing this case from a pathological standpoint, it is requisite to consider the causes of the abnormal communications, the circulation through the abnormal heart, the hypertrophy and dilatation of its chambers, and the association of the renal disease with the cardiac condition. Of the mode of origin of the two abnormal apertures of communication two explanations are offerable: that they were flaws in development; that they resulted from local inflammation, leading to necrobiosis, ulceration, and perforation. The character of these apertures would seem to balance probabilities in favour of their being defects in development. The fact that the septal aperture was situated where congenital defects of the septum are most frequently found, and, in reference to the aperture in the aorta, the absence of disease elsewhere in that vessel, appear to be additional evidence of their being due to defective development, and not to ulcerative endocarditis and endarteritis. As to the absence of an aortic segment, the absence of any signs of the blending of two segments into one, and the absence of any gap between the two existing segments, and the fact that these two occupied the same level, would make it appear that only two segments were developed.

It is reasonable to suppose that the three abnormalities, situated so near to each other, arose from a common cause. Whatever may have been their mode of origin, what was the circulation through the heart? and how may the hypertrophy and dilatation of its chambers be accounted for? Most of the blood of the left ventricle would, by each ventricular systole, pass into the aorta; and, by virtue of the left ventricle being more powerful than the right, it is reasonable to suppose that a portion of blood from it would be driven through the septal aperture into the right ventricle, and another portion into the pulmonary artery through the opening between that vessel and the aorta; and, as the latter opening was between, and not below, the pulmonary valve, the right ventricle would receive the distending force of the two abnormal currents. Also, during ventricular diastole, blood from the aorta would regurgitate into the right ventricle through the abnormal communication between the aorta and pulmonary artery; and thus also the right ventricle would be subjected to overdistension, leading to its dilatation and hypertrophy. The two segments of the aortic valve having to perform the work of three, it is probable that they, despite their dilatation, were unable to prevent regurgitation into the left ventricle; and, as the heart and aorta increased in size with the growth of the patient, the regurgitation would become greater, and lead to dilatation and hypertrophy of the left ventricle.

Granular kidney is a common complication of aortic insufficiency from disease of the aortic valve. The connection in such cases is not at present clear. They may arise from a common cause; or an imperfect circulation may give rise to conditions in the economy conducive to nephritis; or the granular kidney may be the result of an imperfect circulation through the kidney; or a blood-dyscrasia from renal disease

may cause the valve-lesion. The evident chronicity of the cardiac condition, even assuming that it was not congenital, would seem to point to the renal disease being secondary in this case; but, when established, it would react on the heart, causing hypertrophy of its left ventricle.

W. P.'s history favours congenital malformation of the heart. He had always had cardiac symptoms. He had never had any sudden onset of severe symptoms, such as mark communications between the two sides of the heart from ulcerative perforation or the giving way of a segment of the aortic valve. The renal disease doubtless increased the cardiac embarrassment, and probably was the penultimate cause of death. The murmurs, which were very loud, and the purring tremor, which was intense, were characteristic of a communication between the aorta and pulmonary artery; they were probably due in this case, in chief part, to the to-and-fro current of blood through the aperture of communication between the aorta and pulmonary artery; the systolic murmur being heightened by the flow of blood through the septal aperture; the diastolic by regurgitation from the aorta into the left ventricle.

I have to thank Mr. Harvey Smith for assisting me in taking notes of this case.

CASE III. Communication between the Two Ventricles of the Heart: Two Aortic Segments.—W. S., aged 8, was brought to the hospital May 27th, 1880, in a moribund condition with enteric fever, of which he died shortly after admission. His mother said that, up to the time of the fever, he had been a strong boy, and had had no illness except an attack of bronchitis the previous winter. He had always complained of coldness of the hands and feet.

Post mortem, the heart weighed seven ounces. On laying open its left side, the ventricle was seen to be dilated and hypertrophied; the mitral valve was sound; the aorta free from disease. The aortic valve had but two segments; these were greatly dilated and one was a third larger than the other. The larger one showed no signs of subdivision. A small portion of both segments was thickened; the thickened portion was at their attached margin, where they formed part of the boundary of an aperture in the septum ventriculorum. The rest of the segment was sound. In the aortic sinus corresponding to the larger segment was the origin of the two coronary arteries. In the septum ventriculorum, between and below these two segments, was a smooth, round, membranous aperture, around which were some small vegetations; one, resembling a polypus, arose on the rim of the aperture, and permitted of being pushed to and fro from one ventricle to the other. On laying open the right side of the heart, the ventricle was seen to be slightly dilated and hypertrophied. The tricuspid and pulmonary valves were sound. The aperture in the septum was half an inch below the pulmonary valve. On the inner surface of the wall of the ventricle, over an area the size of a sixpenny-piece, was a cluster of vegetations; they were situated exactly opposite to the septal aperture. The ventricle elsewhere was free from vegetations. The spleen was enlarged and soft; the intestines ulcerated; the other viscera normal.

The explanation I would offer of this case is, that one aortic segment was congenitally absent; that, during foetal and infantile life, the two segments by dilatation were competent, or nearly so; but that, as the heart and large vessels increased in size, regurgitation took place, causing hypertrophy and dilatation of the left ventricle. The aperture in the septum I regard as a flaw in development, looking upon the septum as an "imperfect septum". The vegetations around the septal aperture, and the thickening of that part of the two segments which helped to form it, were, I venture to think, the result of extraordinary strain on that part, and the loitering of blood about it consequent on the lateral current through the abnormal aperture. Increased tension of the two aortic segments from the absence of one segment would explain the dilatation of these segments. The vegetations in the right ventricle being confined to a limited area, and being situated exactly opposite to the septal aperture, would make it appear that they had been caused by blood driven through that aperture, and impinging on the wall of the ventricle. This case seems to come into the category of those cases where congenital malformations of the heart are followed by morbid changes in that organ. The abnormality of the circulation probably leading to the disease, the morbid changes may take the form of dilatation, or thickening of valves, or vegetations, or aneurysmal dilatation of congenital apertures, or alterations in the walls, or capacity of the chambers of the heart—a class of cases exemplified also by Cases I and II. I would point to certain features common to this case and Case II: 1. The existence of but two segments of the aortic valve; probably the result of defective development. 2. One of the existing segments is larger than the other, and is subjacent to the sinus of the aorta giving off the two coronary arteries. 3. The existence of an aperture in the septum ventriculorum; probably congenital. 4. The

presence of morbid changes in the aortic segments and in the heart; probably secondary.

I have to thank Dr. Barling, the pathologist, for an account of the *post mortem* of this case.

THE NEW YORK AMBULANCE SYSTEM.

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In the system for the care of emergency cases within the Metropolitan district of New York, there are observable a promptness, ease, and thoroughness not only interesting, but suggestive. This system unites municipal authority with voluntary effort, and affords an exceptional illustration of the efficiency and harmony possible to such combination.

Although not so designated, practically the Chief of the Ambulance System is the Chief of Police. The principal general hospitals which have been placed at his service, accept the regulations imposed, and thus the hospitals in question supplement the single government "House of Relief," and these together form a circle of hospitals at the centre of which is the office of the Chief of Police in telephonic communication with them all. The Chief of Police at any moment, day or night, can have an ambulance from any or every one of these hospitals, at any given spot, as certainly and as quickly as the Chief of the Fire Department can have a fire-engine from any Fire Brigade station at a designated point in a corresponding emergency. For the sake of conformity in this plan, the hospital-buildings erected since the organisation of this system, have included the most careful adaptation to it; while the older hospitals have received corresponding alterations.

On the occurrence of a surgical or medical emergency, information, whether by a policeman or a civilian, is at once given at the nearest police-station; this is telegraphed to the central head-quarter police-office. The officer receiving the telegram can see a chart before him, in which hospital district the emergency in question has occurred, and telephones the call and address to the hospital to which that district belongs.

While I was talking upon this subject in the office of the superintendent of the recently built New York Hospital, the conversation was stopped by a shrill whistle. A telephonic message having been received, and as quickly answered, the superintendent remarked that the message was an emergency call. Following him on a run down a flight of stairs, and under a covered way across an inner courtyard, a surgeon was seen to step into an ambulance, which passed almost noiselessly along the concrete way under the arch and into the street. As the superintendent had telephoned both driver and doctor, before he had explained to me the nature of the interruption in our conversation, while we were simply putting on our hats, the ready harnessed horses had been put in, the doctor had got the start of us, and I had nearly missed the performance the superintendent had asked me to witness.

The ambulance, on returning, comes in from an opposite direction, and stops under the large *porte cochère* on the opposite side of the court, at the door of the reception or accident ward. This room, is supplied with every surgical convenience: operating table, instruments, dressings, hot and cold water, and beds, while opening into it are bathrooms and small bedrooms, all at a constantly agreeable temperature. According to expediency, the patient may remain a longer or shorter time comfortably where he is, be put into a private room adjoining, or be transferred on the lift direct from the table to an ordinary ward above. If, on the other hand, the case be a trivial one, the ambulance takes him at once, or as soon as he may wish, to his own home.

The ambulance-surgeon, immediately on returning to the hospital, according as the case may be surgical or medical, notifies the house-surgeon or house-physician, who then takes entire charge of the case. Before attending to any other duty, however, the ambulance-surgeon enters in a book, kept for that purpose, time of call, start, arrival, departure, return, and such details of history and diagnosis as a coroner's jury might possibly require.

The ambulance-wagons are drawn by two good horses, with light harness; and on the street the driver, by common consent, has the right of way. The vehicle pretty uniformly adopted is in every particular as light as is consistent with its use. Its floor is very low, and the bed, which is on rollers, is by means of sliding handles used as a stretcher also. The roof and curtains are of white duck, which is so extended as to afford good shelter to the driver. Within is a comfortable seat for the doctor, where, if he wish, he can watch the patient *en route*. In the box of the ambulance are all such stores and appliances as are deemed expedient for possible use.

This system seems to have the merit of great equality of advantage.