ON THE OCCURRENCE
OF
MUSICAL MITRAL MURMURS IN CONNECTION
WITH AORTIC STENOSIS

BY

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A boy, Alfred S—, 19 years of age, came under my care at St. George's Hospital on the 24th of February, 1887. The previous history has no bearing on my present purpose. He was partially cyanosed and in a state of extreme cardiac distress; he had much dyspnœa, and was dropsical. The radial pulses were imperceptible, but the heart and carotids were beating violently and at the rate of 174 a minute. The impulse of the heart was extensive, and was attended with a force and sharpness which imparted to the hand a sense of great intra-cardiac tension, which impression was enhanced by the sharpness and accentuation of the sounds. The left ventricle seemed to be distended nearly to

bursting. The sounds were somewhat irregular, and there was an intense systolic murmur at the apex which had a musical character, or as the Medical Registrar, Dr. Slater, expressed it, "a high musical tone." By its intensity it gave the impression of being made under great force. This murmur culminated 2 inches interior to the nipple and 1 inch below it. It gradually diminished towards the aortic area, and was obviously mitral regurgitant. The urine was lithatic and albuminous, the liver enlarged to the touch. Bleeding was clearly indicated, and was practised from the arm to the amount of 6 ounces with advantage; the sounds of the heart became less intense, slower, and more regular. On the 1st of March there was slight hæmoptysis. Bronchitic râles presented themselves extensively, with orthopnœa, and he died seven days after admission.

On post-mortem examination the cedema was very conspicuous. The pericardium contained about 10 ounces of clear fluid. The heart was hypertrophied to the weight of 17 ounces. Both ventricles were dilated, the left greatly hypertrophied. The aortic orifice was almost completely closed by a mass of soft vegetations, the result, apparently, of endocarditis of no very remote date. These choked the passage so that no opening was visible; water passed from the ventricle to the aorta only by slow drops, from the aorta to the ventricle not at all. The mitral valve was practically healthy; upon it were a few small patches of atheroma. The tricuspid and pulmonary valves were perfectly healthy. Each pleura contained about a pint of fluid. The lungs were congested and cedematous; in the left was an apoplectic block. The liver was in a state of venous congestion, and weighed 4 pounds 4 ounces.

This case was, to me at least, instructive and suggestive. Though the disease was aortic obstructive, the murmur was mitral regurgitant, and some of the results—the pulmonary apoplexy, the enlargement of the liver, and the state of the urine—were characteristic of mitral regurgitation.

The distension of the left ventricle was declared by all its sounds and movements, and it could not but be inferred that the exit was in some way impeded. The closure of the aortic orifice, as exposed after death, was so nearly complete that it was not easy to imagine how the circulation could have been carried on. No doubt the great force of the hypertrophied ventricle sufficed to drive through more blood than the post-mortem condition appeared to allow of, though not enough to make a murmur. The only murmur was mitral, though the mitral valve was apparently efficient. As to the manner of its production, it can but be suggested that the valve leaked not because of any imperfection in itself, for there was practically none, but because of the repletion of the ventricle and the pressure within it.

The leakage occurred under extraordinary force, and was attended with a murmur of extraordinary tone. Thus a mitral murmur, and that a musical one, was the result of disease practically limited to the aortic valve.

The impression made on my mind by this case kept me on the look-out for others like it, some of which I will annex, selecting those only which were verified by post-mortem examination.

William C—, 38 years of age, came into St. George's under my care on the 27th of November, 1891. He had had rheumatic fever when young. He was dropsical and short of breath. He had evidence of great hypertrophy of the heart, and a murmur which was thought to be aortic diastolic, though there was some doubt as to its time. The second sound was defective. The pulse was small, not distinctly that of aortic regurgitation. There was little to note bearing on the matter in hand until the following March, when a musical apex murmur attracted attention. On the 7th of this month the condition was as follows :—The heart gave evidence of immense hypertrophy outwards and downwards, and had a tumbling rhythm. At the apex, $2\frac{1}{2}$ inches below and $1\frac{1}{2}$ inches outside the

nipple, was an ordinary blowing systolic murmur, with which was occasionally a definite musical sound or squeak, which was determined, on the joint evidence of several listeners, to resemble the squeak of a mouse. This appeared to be within the blowing murmur, but was quite different in tone. At the base no murmur could be recognised; the second sound was audible. The mitral squeak was held to indicate aortic stenosis. He died on March 15th, with the ordinary symptoms of valvular disease.

After death the heart weighed 27 ounces. The pericardium was much thickened; it contained calcified plates, and the two layers were everywhere firmly united. The left ventricle was greatly hypertrophied and slightly dilated. The left auricle was hypertrophied. The aortic valves were much deformed by fibroid thickening, especially about their surfaces of contact, and were so rigid as to narrow the channel and obstruct the passage. The mitral flaps were thickened, and the orifice crescentic and contracted, so as to admit only the tips of two fingers. On the auricular aspect of the valve were some small vegetations. The tricuspid orifice was dilated, the pulmonary natural. The right auricle was dilated; the right ventricle dilated and hypertrophied.

In this case there was, in addition to other murmurs, a squeak, which was musical if the cry of a mouse be so, which squeak was apparently made in the course of mitral regurgitation, and occurred in the presence of aortic stenosis. The sound was presumably imparted to the murmur by the intra-ventricular tension occasioned by the hypertrophy of the heart and the state of the aortic exit.

Charles C—, aged 69, was admitted into St. George's Hospital on June 12th, 1890. He was dropsical. He had shortness of breath, cough with blood-streaked expectoration, rhonchi over both lungs, and signs of emphysema. The cardiac dulness was increased, the

impulse not to be felt. The heart's sounds were much masked by sounds in the air-tubes, but on the evening of admission Mr. (now Dr.) Davidson, a very competent house physician, heard just to the left of the sternum, in the fifth interspace, a distinct whistle which was synchronous with the systole, and traceable to the axilla. During the night he became cyanosed and delirious, and in the morning died.

I need record only the state of the heart, which had attained the weight of 18 ounces. The left ventricle was hypertrophied and uncontracted. The aortic valves were calcified, adherent to each other, and the orifice in a condition of marked stenosis. The mitral valve was thickened, the orifice not dilated.

I have ventured to include this case though the death of the patient prevented any further observation than that recorded by Dr. Davidson. This however, is, I believe, to be relied on. As in the former instances, there was a musical murmur with the characters of mitral regurgitation, associated with aortic stenosis and hypertrophy of the left ventricle.

William H—, aged 54, was admitted into St. George's Hospital on the 7th of April, 1895, under Dr. Ewart, who permitted me to examine the patient. He had had several attacks of acute rheumatism. On listening to the heart attention was at once attracted by a distinct systolic squeak, like the high note of a fiddle, which was heard all about the apex, loudest $2\frac{1}{2}$ inches below the nipple and 1 inch to its inner side. The apex beat was indistinct, best seen on the level of the ensiform cartilage a little to its left. The first sound was scarcely audible, the second not at all. The dulness was increased, but somewhat indefinite. Pulsation was very visible at the episternal notch, not so marked in the carotids. The radial pulse was large, had a jerk suggestive of aortic regurgitation, and required hard pressure to stop it. The patient died on the day on which this note was made.

Post-mortem.—The heart weighed 17 ounces. Both ventricles were hypertrophied. The aortic orifice was obstructed by a luxuriant mass of solid vegetation which was attached to the edges of the valves, which themselves were rigid from old thickening and stuck out abruptly into the channel, so that partly from the state of the valves and largely from the vegetations upon them, the opening appeared to be almost closed. There was a patch of small vegetations on the septum just underneath the aortic valves. The mitral and tricuspid valves were comparatively little affected. The edges of the mitral were slightly thickened, and on its auricular aspect was a vegetation of the size of a small split pea. There was a little old nodular thickening on the edge of the tricuspid.

In this case, as in the others, there was a musical apex murmur, apparently mitral regurgitant, which was concurrent with, and probably dependent upon, aortic stenosis. The mitral valve was itself diseased, as in most of the other instances, but very slightly so. The conditions essential to the musical and intense murmur which this case and the others exemplify would seem to be mitral regurgitation in small volume at high pressure, the pressure being provided by hypertrophy of the ventricle and aortic obstruction.

Since my attention was drawn to the subject by the first case, that of Alfred S—, I have seen several marked instances, beside those related, in which a sound like the squeak of a small animal, a mouse or guinea-pig, thought to be a mitral regurgitant murmur, has been associated with signs of aortic stenosis; but as these clinical observations have not been explained by post-mortem examination, I have not included them in my series. The examples thus verified are few, and I should have preferred to wait for more had I any reasonable chance of obtaining them; but my hospital work has come to an end, and with it the probability of being able to add post-mortem evidence to what I have already adduced. There may be musical murmurs

of many kinds, as there are many sorts of musical instruments ; I speak only of one, and that one something of a paradox, a mitral murmur which owes its existence or its character to aortic disease.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' Third Series, vol. ix, p. 155.)