THE VENTRICULAR RATE IN COMPLETE HEART-BLOCK.

By A. E. NAISH, M.A., M.B., B.C.CANTAB.,
M.R.C.P.LOND.,
ASSISTANT PHYSICIAN, SHEFFIELD ROYAL HOSPITAL.

In the great majority of cases published so far, when complete heart-block was present, the spontaneous ventricular rhythm has been between 30 and 40 per minute; most commonly in the neighbourhood of 32. Windle¹ has published a case in which the rate was usually 50, and at times rose to over 60 per minute. Lewis² has put on record a case in which, while the auricles were fibrillating, the ventricles beat regularly at about 90 for a few days, and Mackenzie³ mentions a similar case with a ventricular rate of 70; presumably complete heart-block was temporarily present in these two instances. In spite of these 3 cases it is very generally held that the idio-ventricular rate in man is a very constant one, varying but little from 32 per minute.

During the past year I have come across 2 cases in which the rate was not infrequently over 50 per minute, and another one in which the rate was as low as 17. I subjoin a short record of the two former, since it may well turn out that a comparatively rapid idio-ventricular rate is less uncommon than usually supposed, cases remaining undetected owing to there being no remarkably slow pulse-rate to call attention to the condition. As a matter of fact, one of the two had been for some time under the observation of a medical man without special attention having been drawn to his heart.

Erlanger and Blackman,⁴ having succeeded in producing chronic heart-block in 5 dogs, found that even under normal conditions there was a considerable difference between the lowest and highest ventricular rate. In 1 dog there was a variation of 40 beats per minute (maximum 74, minimum 34), and the average variation for the 5 dogs was nearly 25 beats per minute. Under abnormal conditions—for example, nervous states, running exercise, ether, etc.—the maximum rate was usually much higher. Individual dogs also varied from one another, the lowest under normal conditions averaging 35 beats per minute and the highest 50.

The first case, which I have reported more fully elsewhere,⁵ came under observation on April 26th, 1912, and from then up to June 10th showed complete heart-block with the exception of five days in May, when the rhythm was 2:1. During these six weeks the ventricular rate varied from 32 to 52 per minute. The slower rate was only seen after a shower of extra-systoles, which were usually produced by exercise. When resting the rate was most usually about 48, but was sometimes approximately 52 for considerable periods.

In the short stretch of tracing seen in Fig. 1 the average ventricular rate is 50 per minute. It will be seen that the rhythm of the ventricles is not perfectly regular, and in other parts of the tracing the irregularity was even more marked. In Dr. Windle's case irregularity was also noted.

In the second case, a man aged 66, who has shown complete heart-block for the past three months, the ventricular rate has varied between 38 and 54, being most frequently between 40 and 50. Fig. 2 shows the ventricles beating at approximately 52, and the auricles at nearly 65 per minute, a very low auriculo-ventricular ratio.

Apart from the possibility of such cases being overlooked altogether, the faster ventricular rate is more likely to give to a simulation of partial block. With the ventricles beating at 32 per minute the auricles have to beat as slow as 64 or as fast as 96 before there can be an appearance of partial block, and these are both rather unusual for the auricles under ordinary conditions. With the ventricles, on the other hand, beating in the neighbour-

hood of 40 per minute, it is obvious that a partial block must be much more frequently simulated, since the human heart commonly varies between 70 and 90 under conditions of rest or mild exercise. Wardrop Griffith has recorded 2 cases in which the difficulty of distinguishing between complete and partial block was considerable. Erlanger,⁶ in his classical experiments, sometimes found the same difficulty. He says: "Occasionally the ventricular rate in complete block may be an aliquot part of the auricular rate over long intervals of time, and in such instances the ventricular beats may so follow the auricular beats as to appear to be caused by them."

Fig. 1.

Fig. 2.

REFERENCES.

- ¹ Heart, ii, p. 102. ² Heart, iii, p. 279. ³ BRITISH MEDICAL JOURNAL, 1911, ii, p. 872. ⁴ Heart, i, p. 177. ⁵ Quart. Journ. Med., vi, p. 196. ⁶ Amer. Journ. Phys., xvi, p. 160.

THE AURICLE IN MITRAL STENOSIS.

BY
D. W. SAMWAYS, D.Sc., M.D., M.R.C.P.,
MENTONE.

THE somewhat complex series of murmurs audible during the course of a case of mitral stenosis seem to me to find an easy and natural explanation if it be granted that the contraction of the auricle may not cease when that of the ventricle commences, but may continue for a longer or shorter period to overlap it.

Such an assumption is by no means unreasonable.

The late Professor Potain always maintained, basing his conclusions on repeated observations, that the contraction of the auricle continued normally till the time of opening of the aortic valves.¹ Dr. Barclay wrote: "The two cavities (auricle and ventricle) do not contract and dilate alternately, but the contraction of the one overlaps to some extent that of the other."² Roy and Adami gave a series of simultaneous curves, showing the relation in time of the principal elements which united constitute the heart-beat. Those curves show the contraction of the auricle maintained in full force into the time of the out-flow of blood from the ventricle into the aorta.³ Dr. Galabin, commenting on his heart curves, and on those of Professor Marey, wrote: "From a comparison with Marey's tracings we have come to the conclusion that the beginning of the ventricular rise coincides with the first increase of the intraventricular pressure, whereas the auriculo-ventricular valves appear in general to close when the half or the third of the ventricular rise is accomplished."⁴

I am, therefore, not astonished that Dr. James Mackenzie says: "The curves of auricular pressure by different physiologists are very perplexing, some getting a rise of varying duration during ventricular systole."⁵

Now in mitral stenosis a tendency for the auricle to prolong its contraction still further is to be expected, as it would take longer to expel its contents through a stenosed than through a widely open orifice, and considerable evidence has accumulated to indicate that this is so.

If, then, the auricle in mitral stenosis can prolong its