

VENTRICULAR RESPONSE TO AURICULAR PREMATURE BEATS AND TO AURICULAR FLUTTER*

PAUL D. WHITE, M.D., AND HAROLD W. STEVENS, M.D.
BOSTON

The present communication contains observations on ventricular response to auricular premature beats and to auricular flutter with especial reference to the electrocardiogram.

Auricular premature beats may be attended by normal or abnormal ventricular response, normal or aberrant complexes in the electrocardiogram. Of twenty-three patients with auricular premature beats, whose electrocardiograms were taken at the Massachusetts General Hospital, twelve showed entirely normal ventricular complexes following the abnormal auricular deflections; six showed both normal and slightly aberrant ventricular complexes; four showed normal, slightly aberrant and markedly aberrant complexes, and one showed merely slightly aberrant ventricular complexes. In the electrocardiogram of those patients showing both normal and abnormal or aberrant deflections, the earlier the premature beat the more likely it was to be followed by an abnormal ventricular complex (Figs. 1, 2 and 3). In Figure 1 the earliest premature auricular contractions are entirely blocked; those coming later are followed by abnormal ventricular complexes, and those coming latest of all are followed by entirely normal ventricular complexes.

Auricular premature beats may occur in complete heart block without influencing the ventricular rate or rhythm (Fig. 4).

In auricular flutter one ordinarily expects to find a 2 to 1 auriculo-ventricular block, with the ventricular complexes in the electrocardiogram of normal shape. In the cases collected by Ritchie twenty-nine showed 2 to 1 block and twenty-two failed to show it; most of the latter showed varying degrees of block, which produced an irregular pulse. Of twelve patients with flutter seen at the Massachusetts General Hospital five showed 2 to 1 block when first seen, while six had irregular pulses due to varying degrees of block; so far as was ascertained, only one of these six had had any digitalis and that one very little. The eleventh patient showed a 1 to 1 rhythm at the beginning of a paroxysm of flutter. After a few minutes at a very rapid rate in which the ventricles kept up with the auricles even at the

* Submitted for publication Aug. 15, 1916.

* From the medical service of the Massachusetts General Hospital, Boston.

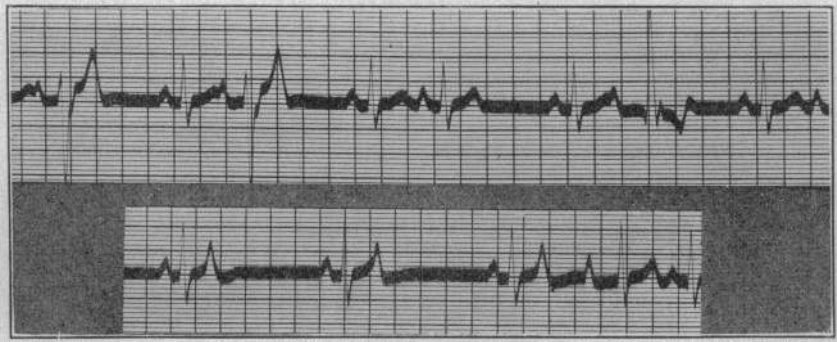


Fig. 1.—Lead II of electrocardiogram of C. S., showing numerous auricular premature beats. In the upper part of the figure the more premature beats show aberrant ventricular complexes, the less premature beat shows a normal ventricular complex. In the lower there are three auricular premature beats without ventricular response; the *P* falls on the *T*. Taken Sept. 1, 1915.

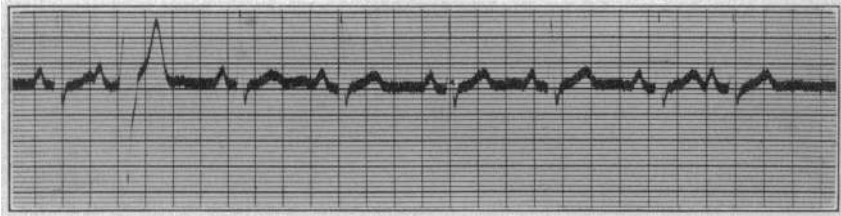


Fig. 2.—Lead II of electrocardiogram of C. S., showing two auricular premature beats. The earlier one is followed by an aberrant ventricular complex, the later by a normal ventricular complex. Taken Dec. 3, 1915.

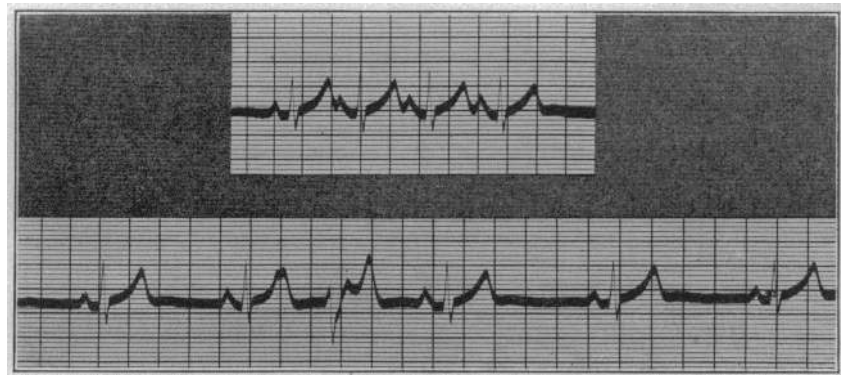


Fig. 3.—Lead II of electrocardiogram of R. M. In the upper part of the figure the premature beats show normal ventricular complexes. In the lower the very premature auricular complex, falling with the *T* deflection, is followed by a markedly delayed aberrant ventricular complex.

speed of 273 per minute, aberrant ventricular complexes suddenly appeared on the electrocardiogram (Fig. 5), suggesting an exhaustion of part of the conduction system (left branch?). Within a few minutes this gave way to a 2 to 1 auriculoventricular block, with the auricles still racing away at high speed. After a quarter hour the rhythm was found to be normal (Fig. 5). The electrocardiogram showing the onset of the change in shape of the ventricular complex is, we believe, unique. The flutter rate was rising from 231 to 273 when the change came, but the increase was gradual and there was no immediate change in rate when the newly shaped ventricular complex appeared. The interventricular intervals over the transition have been measured and found to be in seconds: 0.25, 0.24, 0.26, 0.26, 0.26, 0.23, 0.23, 0.24 | 0.23, 0.24, 0.22, 0.22, 0.22, 0.23, 0.23 . . . 0.23, 0.23, 0.24 . . . 0.24, 0.24, 0.24. The change in shape occurs at the point indicated by the vertical line. The absence of any sudden change in rate and the appearance of 2 to 1 block shortly after favor the view that the change in shape of the ventricular complex is due to aberration, rather than the view that auricular flutter has given way to ventricular flutter. During the taking of this electrocardiogram the change in movement of the string as seen on the screen of the camera suggested at the time the onset of ventricular fibrillation. The ventricular rate recorded in Figure 5 is one of the highest ever recorded graphically. Mackenzie¹ has published a polygram showing a pulse rate of 300 and Lewis² an electrocardiogram with a ventricular rate of 270.

The patient who showed the unusual electrocardiogram described above (Fig. 5) was a woman of 38 years, without other obvious abnormality of the heart, except occasional auricular premature beats. She had never suffered any important illness, with the exception of probable phthisis eight years before, of which there were no longer any definite signs. Her complaints were of nervousness, attacks of palpitation and tachycardia first occurring eighteen months before, and circulatory disturbances in the hands just coming on. Roentgen ray showed the presence of right and left cervical ribs, the right being much the larger. An operation was performed and the right cervical rib was removed. This has resulted in decided improvement in the patient's condition. Occasional auricular premature beats still occur, but no further attack of flutter has been recorded, the patient claiming to be free from all except the most transient palpitation. Her hands also have improved, but are not yet normal. The operation was performed in December, 1915.

1. Mackenzie, J.: *Diseases of the Heart*, London, 1913, p. 246.

2. Lewis, T.: *Lectures on the Heart*, New York, 1915, p. 116.

SUMMARY

Twenty-two of twenty-three patients with auricular premature beats studied electrocardiographically showed normal ventricular complexes following abnormal auricular deflections; of these twenty-two, ten showed also aberrant ventricular responses to some of the auricular premature beats; one case showed only aberrant responses. The earlier the auricular premature beat the greater the likelihood of aberration of the ventricular complex responding.

Five of twelve patients with auricular flutter showed 2 to 1 A-V block when first seen, six showed irregular pulses due to variable block, and one showed a 1 to 1 rhythm. In the latter case a remarkable transition, consisting of aberration of the ventricular complexes, occurred between the 1 to 1 and the succeeding 2 to 1 rhythms. A cervical rib seems to have been at least a contributory cause of the flutter in this case.