Main-Stem Extrasystoles

By Henry J. L. Marriott, B.M., B.Ch. (Oxon.) and Samuel M. Bradley, M.D.

Extrasystoles arising in the main stem of the bundle of His are generally regarded as very rare; only 7 examples have been published since their original description by Lewis in 1911 and 2 of these fail to satisfy rigid criteria for diagnosis. Four further examples, encountered in a relatively small series of tracings, are here presented and it is concluded that such extrasystoles are not so much rare as they are overlooked.

Extrasystoles arising in the main stem of the bundle of His are reported to be very rare.1,2 Although first described in 1911 by Lewis,3 Fletcher4 was recently able to collect only 6 examples from previous publications5-7 and he added a seventh of his own. Our experience during the last several months has led us to the conclusion that premature beats fulfilling the criteria of main-stem extrasystoles are not so much rare as they are overlooked. In ignorance of the criteria, and if critical thought is not exercised, it is all too easy to dismiss such extrasystoles as "supraventricular" or "nodal" beats, or to overlook them altogether.

We became aware of the criteria for their diagnosis only when we read Fletcher's recent article. During an arbitrary period of 5 months since then, in the course of interpreting only 1,350 consecutive electrocardiograms in a general hospital, we have noted their occurrence in 4 patients. The number of patients exhibiting the various other types of extrasystoles in this same series of tracings is presented for comparison in table 1.

Case Reports

Case 1. A 40-year-old white woman was admitted for excision of a cyst of the left labium minus. In the past history an attack of rheumatic fever at age 7 was recorded and there had been recurrent attacks of joint pain but no cardiac symptoms had developed. On examination there was no evidence of cardiac enlargement but there was a grade 2 blowing systolic murmur heard at the apex; blood pressure was 135/68. An electrocardiogram was normal; one main-stem extrasystole was noted in lead 1 (fig. 1A).

Case 2. A 60-year-old Negro man was admitted with a history of progressive congestive heart failure during the past 6 months. On physical examination there was an enlarged heart, basal rales, enlarged liver, and edema. Frequent premature beats were noted and the blood pressure was 120/80. The cause of the heart failure was not established but was assumed to be coronary disease. An electrocardiogram showed left ventricular hypertrophy, electric alternans in several precordial leads, digitalis effect and occasional main-stem extrasystoles (fig. 1B).

Case 3. A 34-year-old Negro woman was admitted with the chief complaint of left lower quadrant pain and tenderness. On examination a cervical erosion and uterine fibroids were found. An abdominal hysterectomy was performed and microscopy revealed endometrial hyperplasia. Three days after operation an arrhythmia was noted clinically and an electrocardiogram showed occasional main-stem and numerous ventricular premature beats (fig. 1C).

Case 4. A 48-year-old white man was admitted for excision of fissure in ano and repair of anal stricture. Blood pressure was 110/90 and there were no symptoms or signs of heart disease. A postoperative electrocardiogram, obtained because of the complaint of chest pain, was normal but contained numerous main-stem extrasystoles (fig. 2A). A second tracing, taken several days later, again revealed many main-stem extrasystoles (fig. 2B).

Discussion

Main-stem extrasystoles evidently show remarkably varying degrees of prematurity. Some are barely premature so that they occur after the next expected sinus P wave (fig. 1B); others coincide with the P wave (fig. 2A); others are more premature with postincident P waves (fig. 1A and C); still others are so premature that they are interpolated (fig. 2B). Similar variability is observable in the examples previously published. In one case7 the extra-
systolic focus in the main stem apparently acted as a parasystolic pacemaker.

The criteria considered necessary for the diagnosis of main-stem extrasystoles are (1) 

**Table 1.—Relative Incidence of Various Types of Extrasystoles**

<table>
<thead>
<tr>
<th>Type of extrasystole</th>
<th>Number of patients exhibiting extrasystoles</th>
<th>Per cent of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventricular*</td>
<td>207</td>
<td>66.6</td>
</tr>
<tr>
<td>Atrial</td>
<td>81</td>
<td>26.0</td>
</tr>
<tr>
<td>Supraventricular†</td>
<td>11</td>
<td>3.5</td>
</tr>
<tr>
<td>A-V nodal</td>
<td>7</td>
<td>2.2</td>
</tr>
<tr>
<td>Main-stem</td>
<td>4</td>
<td>1.3</td>
</tr>
<tr>
<td>Sinus</td>
<td>1 (?)</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td><strong>311</strong></td>
<td><strong>99.9</strong></td>
</tr>
</tbody>
</table>

* Including ventricular extrasystoles occurring during atrial fibrillation, some of which presumably represent ventricular aberration in conducted beats. † Of indeterminate origin.

premature beats having the same form as conducted sinus beats; (2) the sequence of P waves undisturbed in time and form; and (3) a compensatory pause following the extrasystole. Such beats thus have 1 feature in common with supraventricular and 2 in common with ventricular premature systoles. At times the sole manifestation of their presence is a shortening of the apparent P-R interval (e.g., fig. 1B, lead 3) and they are then especially likely to be overlooked.

It should be stressed that main-stem extrasystoles, even by these criteria which are the most rigid available, can never be diagnosed with unreserved certainty; for their diagnosis depends on the assumptions that beats originating in the atrioventricular node itself would be conducted backwards into the atria and that, as the beats in question are not so conducted, they are more likely to have arisen at a lower site above the branching of the bundle.

**Fig. 1.** A. Case 1. The fifth beat is premature and of supraventricular form, and is closely followed by a normal rhythmic P wave and a fully compensatory pause. B. Case 2. The sixth beat in lead II and the seventh in lead III are premature and of supraventricular form; in each lead the normal sinus P-wave sequence is undisturbed. C. Case 3. Second and sixth beats are premature and of supraventricular form; they are followed by undisturbed sinus P waves and compensatory pauses.
i.e., in the main stem. It follows that there can never be unassailable proof that a beat fulfilling the above criteria is not a nodal beat with blocked retrograde conduction. The extrasystoles published by Wenckebach and Winterberg\(^5\) fully satisfy the criteria for main-stem extrasystoles but were regarded by them as nodal beats with retrograde block. By a similar token, however, the common ventricular extrasystole can also never be diagnosed with unequivocal certainty; for there is always the possibility that such a beat is a main-stem extrasystole with aberrant ventricular conduction. These reservations should be borne in mind in assessing any claims for the identification of main-stem extrasystoles.

Despite these limiting considerations, some authors have been satisfied with less than the criteria outlined above and, of the 7 records previously published, the claims of 2 may reasonably be questioned: 1. In the tracing of Lewis and Allen\(^4\) the extrasystoles show ventricular aberration and therefore may well be ectopic ventricular systoles. 2. The record pub-

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**Fig. 2.** Case 4. *A.* The fourth beat in lead I and the fifth in lead II are premature and of supraventricular form but do not disturb the normal P-wave sequence; in lead I the sinus P wave is seen deforming the S-T segment, in lead II it coincides with the premature QRS. Each beat is followed by a compensatory pause. *B.* Two strips from lead II at later date. The fourth beat in the upper strip is premature with a normal post-incident P wave deforming the S-T segment; the fourth beat in the lower strip is an interpolated extrasystole, presumably also arising from the main stem.

**Fig. 3.** The fourth beat is premature. Its P wave is obviously ectopic and presumably of nodal origin. This unequivocally supraventricular extrasystole is followed by a fully "compensatory" pause.
lished by Scherf and Schott\(^2\) shows left bundle-branch block and the premature beat, regarded as a probable main-stem extrasystole, has the same configuration as the sinus beats. The P wave is not visible, however, and the diagnosis therefore rests heavily on the presence of a fully compensatory pause following the extrasystole. This is inadequate evidence on which to base the diagnosis, as it is not uncommon to observe a “compensatory” pause following an extrasystole that is unequivocally of supraventricular origin\(^8\) (fig. 3).

Thus in the past 45 years apparently only 5 examples that satisfy the most rigid criteria for diagnosis have been published. As we have been able to observe 4 examples in a few months in a relatively small number of tracings, we believe that the phenomenon is probably not rare but often goes unrecognized.

**SUMMARY**

Main-stem extrasystoles are stated to be very rare, yet, in the course of reading only 1,350 consecutive electrocardiograms, 4 examples were encountered—an incidence of 1 in less than 350 tracings. These 4 cases are briefly presented with illustrative electrocardiograms. The phenomenon is probably more overlooked than rare.

**SUMMARIO IN INTERLINGUA**

Extrasystoles a trunco major es considerate como multo rar. Tamen, in le curso del lecturas de solmente 1350 consecutivae electrocardiogrammas, 4 exemplos de extrasystoles de iste genere eseva incontrate. Isto representa un incidentia de 1 in minus que 350 registrationes. Le 4 casos es discutite brevemente. Electrocardiogrammas illustrative es presentate. Il es probabile que le phenomeno non-recognoscite plus tosto que rar.

**REFERENCES**

8. **MARRIOTT, H. J. L.**: Practical Electrocardiography, Baltimore, Williams and Wilkins, 1954, fig. 48 on p. 73.

**Medical Eponyms**

*By Robert W. Buck, M.D.*

**Angle of Louis.** Johann Friedrich Conradi, in his Giessen Dissertation (1848) page 3, refers to the *angulus Ludovici* and in a footnote explains: "I understand by *angulus Ludovici* that more or less prominent outward angulation of the sternum which is formed by the junction of the manubrium with the body, and to the marked development of which, when the upper part of the thorax is sunken in, Louis of Paris has chiefly directed the attention of pathologists." No reference to the angle has been found in the published works of Pierre-Charles-Alexandre Louis (1787–1872).
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Circulation. 1957;16:544-547
doi: 10.1161/01.CIR.16.4.544
Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
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