Interesting Electrocardiograms

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This 76-year-old man was admitted for elective surgery to repair an inguinal hernia. Medical history was negative. The electrocardiogram was taken in the course of a pre-operative work-up.

The ECG showed normal sinus rhythm at 65 per min., with a very short P-R interval (0.10 sec.). On the fourth beat of the first lead set (simultaneous leads I, II, III), which is marked with an arrow, there is an atrial premature contraction. This latter beat has a low, rather flat P wave preceding the QRS with a P-R interval of 0.20 sec. The contrast between the sinus beats (with short P-R) and this atrial premature beat is marked. The direction of the P wave or P vector in the sinus beats is normal and hence the short P-R does not characterize an A-V nodal rhythm. The QRS-T complexes are normal. Thus the tracing indicates sinus rhythm with pre-excitation of Lown-Ganong-Levine, or LGL, type. A short P-R accompanied by a prolonged QRS and delta waves (which is not the case here) identifies pre-excitation of the Wolff-Parkinson-White type (WPW).

There are three types of pre-excitation known at present, with the WPW form being the commonest, the LGL much rarer and the Mahaim type being very rare. Figure I is a diagram of the anatomical bypass tracts which are present in these three types. The basic mechanism of all three is the same, namely, that atrial excitation from the S-A node reaches the ventricles ahead of time because of the existence of some form of bypass around, or short circuit past, the A-V node. Thus the normal delay that occurs at the upper crest of this A-V node does not operate in pre-excitation. The three types of bypass tracts (see Figure I) include the classical muscular A-V bridge called the bundle of Kent, the paranodal James fibers which circumvent only the A-V nodal crest and allow excitation to enter the lower node or upper His bundle, and the third tract, the muscle bundles of Mahaim which connect the lower node or upper His bundle directly to the IV septum. The James fibers account for the LGL type of pre-excitation seen on the electrocardiogram shown here.

The LGL form is much less common than the WPW form. Both are associated with episodes of supraventricular arrhythmias — atrial tachycardia, atrial flutter or fibrillation, and occasionally junctional tachycardia. The LGL form is more likely to be missed on reading the ECG since the QRS-T is normal. Careful measurement of the (short) P-R interval however, is the only diagnostic move necessary.

The incidence of pre-excitation is not low and it can be found at any age — from infancy into the seventh and eighth decades. We only have figures, however, for the WPW form (with Kent bundle) since the other two forms have only recently been described. The WPW form has an incidence of between one and two per thousand. In the recently completed ECG survey done at the Home Office of the Metropolitan Life Insurance Company the incidence figures will be reviewed both for the WPW and LGL forms. In 19,734 ECGs reviewed in this survey there were 40 with pre-excitation (0.2% — or 2 per thousand). The breakdown into WPW and LGL is not yet available but will be forthcoming.

The insurance aspects of the LGL form are virtually unknown. At present the subject who does not have arrhythmias appears to have a normal prognosis. The insurance handling of subjects with the LGL form and arrhythmias is probably best guided by the practice applied to the commoner form, the WPW syndrome, until further details can be secured.

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Figure 1. Anatomical bypass tracts existing in human hearts. Note: (a) Caudal ends of three internodal tracts, the upper arrow indicating the site of entry into A-V node of the anterior and middle tract fibers, and the lower two arrows, the paranodal fibers of James bypassing the nodal crest. (b) Four different Mahaim tracts. The first connects lower A-V node to the IV septum, the second the upper His bundle to the IV septum, the third connects the left main bundle branch to adjacent IV septum or basal ventricle, the fourth connects the main right bundle branch to the IV septum or right ventricular base. (c) Bundle of Kent. (Reproduced by permission from Ferrer, M.I.: New concepts relating to the pre-excitation syndrome. JAMA. 201:162, 1967.)