The Incomplete Left Bundle Branch Block*

R. H. WASSERBURGER, M.D., D. H. WHITE, M.D. AND E. R. LINDSAY, M.D.

Madison, Wisconsin

The incomplete left bundle branch block (ILBBB) has received scant attention in the literature as an electrocardiographic entity, seemingly due to its multiple etiologies and its superficial resemblance to left ventricular preponderance (LVP),** and left ventricular ischemia. In a review of current texts, Friedberg, Lipman and Massie, Wolff and Levine stress the difficulty in electrocardiographically differentiating the ILBBB from left ventricular hypertrophy (LVH). Grant questions it as an electrocardiographic entity and Goldberger and Plotz fail to describe it.

It is hoped that these current data, supported by a review of previous pertinent works,* will more firmly establish the ILBBB as a fairly common electrocardiographic pattern. Most certainly, it is a frequent cause for electrocardiographic misinterpretation.

Materials and Methods

Forty-six instances of the ILBBB (QRS 0.08 - 0.10 sec.) were collected at the Electrocardiographic Heart Stations, University Hospitals and the Veterans Administration Hospital, Madison, Wisconsin. By definition, the ILBBB requires the loss of the normal left ventricular septal q wave, being replaced by an initial r wave, implying R>L septal depolarization, a QRS duration of 0.08 - 0.10 sec., and secondary ST segment and T-wave changes, which are characteristically depressed and outwardly bowed, with a proximally diphasic T wave.

Clinical correlations, including chest roentgenograms, were made on all patients.

Necropsy data were available on three patients.

Results

Classic examples of the ILBBB are shown in Fig. 1, with the normal left ventricular septal q wave replaced by a distinct initial r wave in V₆, V₅ and V₄. The left ventricular activation time measures 0.05 - 0.07 sec., as recorded from the preceding isoelectric line to the peak of the R' wave, the exact measurement dependent upon the total QRS duration.

The rR' configuration, or the grossly slurred left ventricular R waves of the ILBBB are seen to best advantage in standard or augmented limb leads I and AVL of Fig. 2. Only gross slurring at the base of the left ventricular R waves of the ILBBB (representing the initial septal r wave component) are present in Fig. 3. Post-infarctional ILBBB's are shown in Fig. 4.

On occasion, the initial septal r wave of the ILBBB appears as a q wave in the more extreme lateral chest leads (V₆, V₇ and V₈), where the initial low amplitude septal r wave component is to all intents buried in the preceding isoelectric line, and the apparent initial q wave of the QRS complex in V₆ is actually the s wave component of the ILBBB (Fig. 5).

Of the 46 patients presenting with an ILBBB, 22 had arteriosclerotic heart disease, eight of whom had classic angina pectoris and six related alleged episodes of previous myocardial infarction; six had rheumatic heart disease, with aortic stenosis or insufficiency in five and mitral insufficiency in one; ten had advanced hypertensive heart disease and four had pulmonary emphysema with interstitial fibrosis. One had systemic amyloidosis and three patients were free of obvious cardiac disease, although one of these related bouts

*From the Department of Medicine, Veterans Administration Hospital and the Cardiovascular Laboratory of the Department of Medicine, University of Wisconsin Medical School.
**Left ventricular preponderance is preferred to left ventricular hypertrophy, as one is recording an abnormal potential and is assuming anatomic hypertrophy.
of paroxysmal tachycardia. Generalized cardiomegaly, with predominant left ventricular enlargement were the roentgenologic features of the arteriosclerotic and hypertensive subjects.

Necropsy examinations confirmed left ventricular hypertrophy in three patients and residual postero-septal wall myocardial infarction in patient J. S. (Fig. 4). Two showed alternating CLBBB and ILBBB patterns on serial tracings and a single patient revealed the alternating patterns on a single electrocardiographic strip.

**DISCUSSION**

Wilson arbitrarily designated the ILBBB to have a QRS duration of <0.12 sec., but otherwise to have QRS morphology similar to that of the CLBBB.

Sodi-Pallares et al., Sodi-Pallares and Calder, Bain, Rodriguez and Sodi-Pallares and Myers have all presented

![Electrocardiogram tracings](image)

**FIGURE 1**: Classic examples of the ILBBB. Note the loss of the normal septal q wave in the left ventricular leads, with replacement by an initial r wave.
electrocardiographic data supporting the presence of the ILBBB.

Bain\cite{19} published his six case reports in 1944, utilizing the criterion of a QRS duration of less than 0.10 sec. Sodi-Pallares et al.\cite{20} felt the QRS duration may be 0.09 - 0.11 sec. They stressed the slurring at the base of the upstroke of the left ventricular R wave as the most important single diagnostic facet in suggesting the presence of an ILBBB, and favored this finding over the absence of the normal left ventricular q wave. They also suggested that many examples of the Wolff-Parkinson-White syndrome (WPWS) are actually ILBBB or CLBBB patterns. Rodriguez and Sodi-Pallares\cite{21} demonstrated varying degrees of ILBBB (variable QRS durations) in the experimental animal, thereby bridging the experimental and the clinical aspects. In their text, Sodi-Pallares and Calder list three classes or degrees of ILBBB. These refinements are not necessary, however, to appreciate the basic configuration.

Myers\cite{22} presents a most lucid discussion of the ILBBB in his monograph. Whereas with the CLBBB, the septal depolarization is delayed to 0.04 sec. or more; with the ILBBB, only 0.02 - 0.04 sec. is required for septal depolarization and the onset of left ventricular wall depolarization. He stressed the necessity for the loss of the normal q wave in the left ventricular leads, implying R>L septal depolarization, to entertain the existence of an ILBBB.
ILBBB occurs when the depolarization through the bundle branch is delayed, but by less than 0.04 sec. Partial interruption of the bundle, however, is not implied. With increasing delay of conduction, the QRS broadens and a CLBBB is the electrocardiographic result.

Finally, a retrospective correlation of anatomic septal fibrosis with the absence of the normal septal q wave in the left ventricular leads (I, AVL, V₅, and V₆) of the conventional electrocardiogram has been studied by Burch and DePasquale. One hundred and forty-two instances of septal fibrosis confirmed at necropsy yielded 101 electrocardiograms with loss of the normal septal q wave. Although they avoided the use of the term ILBBB, one of their reproductions was a classic example. Interestingly, of the 142 necropsied cases, 118 had angina pectoris and 114 had anatomic evidence of LV hypertrophy.

The hesitancy of many cardiologists to accept the ILBBB as an electrocardiographic entity seems unfounded. The pattern has clarity of definition, and in no way differs from that of the CLBBB, save for the QRS duration which is less than 0.12 sec., and fairly characteristically measures 0.08 - 0.10 sec.

The differential features of the ILBBB and LVP are also clear cut, and should cause no major deception; the ILBBB has a loss of the normal left ventricular septal q wave, with an initial slur or a distinct initial r wave at the base of the left ventricular r'R' complex, and an activation time of 0.05 - 0.07 sec., as measured from the beginning of the QRS complex to the peak of R' component (dependent upon the total duration of QRS complex). LVP, on the other hand, must have a normal left ventricular septal q wave, a clean, unnotched left ventricular R wave, and a left ventricular activation time of 0.04 - 0.05 sec., as measured from the nadir of the septal q wave to the peak of the left ventricular R wave. Characteristically, but not invariably, both have a depressed, outwardly bowed ST segment, inverted T waves,

Dickens et al., utilizing ventricular endocardial leads, felt that on occasion, it is most difficult to distinguish LBBB from LVP by the conventional electrocardiogram. The ILBBB was, however, considered to be a distinct electrocardiographic entity and that an entirely normal QRS duration could exist with an ILBBB. Left ventricular endocardial leads (via left atrial puncture) usually identified an initial septal r wave, implying R>L septal depolarization. Technical difficulties, however, obscured many of their reproductions.

Only recently, Scherf has published an excellent review of the entire bundle branch system. His concept is in complete agreement with that of Myers, namely that the
prolonged QT intervals (electrical systole), and tend to be stable electrocardiographic patterns, although the ILBBB is less so and on occasion, may be quite transient.

Although arteriosclerotic coronary artery disease and left ventricular hypertrophy are the most common anatomic findings associated with ILBBB, neither entity should categorically appear in the electrocardiographic impression.

Figure 4: ILBBB secondary to previous myocardial infarction. rR' complexes are identified in V₅ and V₆ of patient G. N., age 40, while grossly slurred left ventricular R waves are present with J. S., age 68 years and J. B., age 62 years.

Figure 5: The initial septal r wave of the ILBBB is identified in V₅, with an apparent initial q wave in V₄. Actually, the initial septal r wave is also present in V₄, albeit of limited amplitude, and the apparent q wave in V₅ is in fact, an s wave.
SUMMARY

The incomplete left bundle branch block is an electrocardiographic entity, having well defined criteria, yet is a frequent cause of misinterpretation.

The R>L septal depolarization results in loss of the normal left ventricular q wave, being replaced by an initial r wave. On occasion, the initial r wave component may be fused on the ascending limb of the predominant left ventricular R’ wave, making identification of the ILBBB more difficult.

The ILBBB electromotively differs in no way from the CLBBB, save for a QRS duration of 0.08 - 0.10 sec.

Arteriosclerotic (coronary artery disease) and hypertensive heart disease (left ventricular and probable septal wall hypertrophy) are the two most common clinical and anatomic entities associated with the ILBBB.

RESUMEN

El bloqueo incompleto de rama izquierda es una entidad electrocardiográfica que no obstante tener un criterio bien definido aún es una causa de mala interpretación.

La despolarización R>L septal resulta en pérdida de la onda ventricular q, que es sustituida por una onda inicial r. Occasionalmente el componente de la onda inicial r puede fusionarse con la rama ascendente de las ondas ventriculares R', lo que hace la identificación de ILBBB más difícil.

El ILBBB no difiere por su electromotividad de CLBBB, salvo por una duración de QRS de 0.08 - 0.10 segundos.

Las entidades más comúnmente ligadas clínica y anatómicamente a ILBBB son la enfermedad arteriosclerosa (enfermedad de arteria coronaria) y la hipertensión cardiaca (hipertrofia septal probable e hipertrofia ventricular).

RéSUMÉ

Le bloc de branche gauche incomplet est une entité électrocardiographique qui a des critères bien définis; cependant son interprétation est souvent erronée.

La dépolarisation septale de droite à gauche entraine la disparition de l'onde q normale, ventriculaire gauche, remplacée par une onde r initiale. Parfois l'onde r initiale peut être fusionnée avec la branche ascendante de l'onde R' ventriculaire gauche principale, rendant l'identification du bloc gauche incomplet plus difficile.

Sur le plan électro-moteur, le bloc gauche incomplet ne différe en rien du bloc complet, sauf que l'intervalle QRS dure 0,08 à 0,10 seconde.

Les cardiopathies d'origine aorteriosclérotique (maladie coronaire) et hypertensive (hypertrphie du ventricule gauche et probablement du septum) sont les deux conditions cliniques les plus communes et les entités anatomiques habituelles associées avec le bloc de branche gauche.

ZUSAMMENFASSUNG

Ein unvollständiger Block des linken Astes des Reizleitungssystems ist ein elektrokardiographisches Krankheitsbild, das wohl definierte Kriterien aufweist, trotzdem aber häufig die Ursache einer Fehldeutung ist.


Elektromotorisch differiert der unvollständige Block des linken Astes des Reizleitungssystems in keiner Weise mit einem kompletten Block dieses Astes, abgesehen von einer QRS-Dauer von 0,08 bis 0,10 Sekunden.

Arteriosklerotische (Herzerkrankungen-Erkrankung) und hypertensive Herzerkrankung (Hypertrphie der linken Kammer und wahrscheinlich auch der Kammerscheidewand) sind die beiden häufigsten klinischen und anatomischen Krankheitsbilder, die mit dem unvollständigen Block des linken Astes des Reizleitungssystems verknüpft sind.

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**EXPERIMENTAL AND CLINICAL STUDY WITH 5K203, A NEW DERIVATIVE OF KANAMYCIN**

This study is concerned with a new, less toxic derivative of kanamycin, the kanamycin monosulfate-N,N'-dimethane sodium sulfonate (5K203). Both in vitro and in animal tests, the antituberculosis activity of the drug was similar to that of kanamycin sulfate. In a clinical study, involving 61 patients with pulmonary tuberculosis, 11 were treated with 5K203 only. The ototoxicity was considerably less than in the 50 patients treated with kanamycin sulfate combined with isoniazid, being 27 per cent and 77 per cent respectively. It was also noted that the ototoxicity was manifested later in the cases treated with 5K203. The authors conclude, however, that 5K203 should be reserved for selected cases and that its use should always be accompanied with frequent audiograms.


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**OBSERVATIONS REGARDING TUBERCULOSIS AMONG AFRICANS RECENTLY ARRIVED IN PARIS**

This is a study of 72 cases of pulmonary tuberculosis found in Africans recently arrived from Mali, Senegal and Mauritania. The disease was discovered on routine physical examination by the Bureau de Travail (labor office). It appeared to be of a highly contagious primary type with an unusual incidence of mediastinal adenopathy, 38 cases, and with a significant incidence of pleurisy and pericarditis. It is possible that the disease was contracted after arrival in the Paris area, but is difficult to state definitely whether or not the disease was contracted before or after arrival in France, because there was no adequate screening before departure from their native countries.


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**THE SULPHONE ANALOGUE OF D-METHADONE**

The compound under test, described in this paper "methadone-S," is the sulphone analogue of dextromethadone. Animal pharmacology suggested that the drug was a fairly potent antitussive with a long duration of action. Experimentally-induced cough experiments suggested that in 2 mg. doses of the drug, cough suppression was no better than that produced by codeine phosphate gr. 1/4 at the end of one hour. At the end of two hours, however, the new drug did appear to be more effective. Clinical trial was carried out involving 85 patients with cough. There was no pronounced difference between the two drugs, methadone-S 2 mg. three times daily and codeine phosphate gr. 1/4 three times daily. Subsequent analysis of the results confirmed that the new drug had no advantage over the codeine. There was no pronounced difference in the relative incidence of side effects, except that constipation seems to occur more commonly with methadone-S and drowsiness with codeine.