Prognostic significance of isolated left anterior hemiblock and left axis deviation in the course of acute myocardial infarction

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In 700 patients with acute myocardial infarction admitted to the intensive coronary care unit of our hospital, the incidence and significance of left anterior hemiblock and left axis deviation has been studied in the acute phase of disease. In 102 (14.6%) of the 700 patients, isolated left axis deviation (mean QRS axis -45°) was found and 69 of them (9.9%) met the criteria of left anterior hemiblock. Of the 69 patients with left anterior hemiblock, 61 had acute anterior myocardial infarction, 5 had inferior infarction, and 3 had subendocardial infarction. The left anterior hemiblock was transient in 5 patients, but persisted in 64. All patients with and without isolated left anterior hemiblock and left axis deviation were compared statistically with reference to mortality rate and the incidence of arrhythmias; no significant difference was noted. However, in patients over the age of 65 and also in those with hypertension, the incidence of left axis deviation was significantly higher (P<0.05 and P<0.001, respectively).

It was concluded that isolated left anterior hemiblock and left axis deviation occurring in the course of acute myocardial infarction had no influence on the prognosis of acute myocardial infarction.

Intensive studies have been made on the intraventricular blocks occurring in the course of acute myocardial infarction. These studies showed that complete bundle-branch blocks (Bauer et al., 1965; Hunt and Sloman, 1969; Godman et al., 1970; Norris and Croxson, 1970) and incomplete bifascicular block have adverse effects on the prognosis of acute myocardial infarction (Kulbertus and Collignon, 1969; Watt and Pruitt, 1969; Atkins et al., 1970; Castellanos et al., 1970; Roos and Dunning, 1970; Scanlon et al., 1970). Investigations concerning prognostic significance of isolated left anterior hemiblock and left axis deviation are rare. Reports published on this type of conduction defect revealed that it had no adverse effect on the prognosis of acute myocardial infarction (Pryor and Blount, 1966; Marriott and Hogan, 1970; Col and Weinberg, 1972; Kincaid and Botti, 1972).

The aim of the work presented here was to study the effects of isolated left anterior hemiblock and left axis deviation on the course and prognosis of acute myocardial infarction.

Subjects and methods

The hospital records of 700 patients admitted to the intensive coronary care unit with evidence of acute myocardial infarction during a 5-year period from January 1969 to January 1975 were studied in detail. Of these 700 patients, 116 were women aged 42 to 88 years (average 62±4 years), and 584 were men aged 29 to 86 years (average 55±7 years). The age of the whole series ranged from 29 to 88 years (average 57±9). The diagnosis of acute myocardial infarction was based on the history, physical signs, and electrocardiographic and serum enzyme changes, and other related laboratory investigations (World Health Organization, 1971). The 12-lead serial electrocardiograms and single lead monitor records were used for the analysis of the rhythm and conduction disturbances.

All patients with a mean frontal plane QRS axis of -45° or more leftward and normal QRS duration were included in this study. This group of patients with left axis deviation was further subdivided into 69 patients with and 33 patients without electrocardiographic signs of classic left anterior hemiblock. The terminology and criteria for conduction

1This work was presented, in part, at 7th European Congress of Cardiology, 20-25 June 1976, Amsterdam, The Netherlands.

Received for publication 4 April 1977
defect in the left anterior fascicle were taken from Rosenbaum et al. (1970), Pryor (1971), and Rosenbaum et al. (1972). Those patients with a mean frontal plane QRS axis of −45° or more leftward, and initial right inferior vector with r waves in leads II, III, aVF, and with a Q wave in lead aVL, followed by a left superior vector, were included in this subgroup of patients with left anterior hemiblock. Those patients with left axis deviation with QS complexes and with no terminal R waves in leads II, III, and aVF were accepted as having a combination of an old inferior myocardial infarction and left anterior hemiblock (Rosenbaum et al., 1969a, 1970; Marriott and Hogan, 1970; Castellanos et al., 1971; Benchimol et al., 1972; Rosenbaum et al., 1972; Schamroth, 1975). Those with left axis deviation but not meeting the criteria for left anterior hemiblock were included in the second subgroup. The patients in the latter group (without signs of left anterior hemiblock) had no Q waves in aVL or had small Q waves in leads II, III, and aVF.

Results

Of the 700 patients with acute myocardial infarction, 102 (14.6%) had frontal plane left axis deviation (−45° or more leftward). Of these 102 patients, 69 (9.9%) had classic left anterior hemiblock, 25 (3.6%) had left axis deviation with Q waves in II, III, and aVF, and the remaining 8 (1.1%) had left axis deviation with no Q waves in leads I and aVL.

Table 1  Hospital mortality of patients

<table>
<thead>
<tr>
<th></th>
<th>Patients (No)</th>
<th>Deaths (No)</th>
<th>Mortality %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>700</td>
<td>98</td>
<td>14.0</td>
</tr>
<tr>
<td>With LAD but without bundle-branch block</td>
<td>102</td>
<td>12</td>
<td>11.8</td>
</tr>
<tr>
<td>Remainder</td>
<td>598</td>
<td>86</td>
<td>14.4</td>
</tr>
<tr>
<td>With no intraventricular conduction defect</td>
<td>504</td>
<td>61</td>
<td>12.1</td>
</tr>
<tr>
<td>With LAHB</td>
<td>69</td>
<td>9</td>
<td>13.0</td>
</tr>
<tr>
<td>With LAD but no Q wave in aVL</td>
<td>8</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td>With LAD but Q waves in II, aVF</td>
<td>25</td>
<td>2</td>
<td>8.0</td>
</tr>
</tbody>
</table>

LAD, left axis deviation; LAHB, left anterior hemiblock.

Mortality

During this 5-year period the overall mortality rate for our 700 patients with acute myocardial infarction was 14 per cent (98 deaths) (Table 1). However, the mortality rate for 102 patients with left axis deviation was 11.8 per cent (12 deaths) and for 69 patients with isolated left anterior hemiblock was 13 per cent (9 deaths). Thus, on our series the mortality rate was not increased in the presence of left axis deviation and/or left anterior hemiblock (P < 0.9).

Associated arrhythmias

Table 2 compares the different groups with regard to development of arrhythmias during the course of acute myocardial infarction while the patients were in the intensive coronary care unit. The patients with isolated left anterior hemiblock or left axis deviation without left anterior hemiblock did not have an increased incidence of atrioventricular block, atrial fibrillation, atrial flutter, or ventricular premature beats. Ventricular tachycardia seemed to occur more frequently in the group with left anterior hemiblock though the difference was not significant. The 61 patients with an acute anterior myocardial infarction with left anterior hemiblock was compared with 262 patients with acute anterior myocardial infarction without left anterior hemiblock to assess the development of arrhythmias. Again, no significant difference was observed between these comparable groups (Table 3).

Site of infarction

Of the 69 patients with isolated left anterior hemiblock, 61 (88%) had an anteroseptal myocardial infarction, 5 (7.2%) had inferior myocardial infarction, 3 (4.3%) had subendocardial (nontransmural) infarction, and 7 (10.1%) had a history of multiple infarctions. Of the 33 patients with left axis deviation without left anterior hemiblock, 21 (63.6%) had an anteroseptal myocardial infarction, 6 (18.2%) had inferior myocardial infarction, 6 (18.2%) had anteroseptal infarction, 6 (18.2%) had subendocardial infarction, and 12 (36.4%) had multiple infarctions.

Table 2  Incidence of arrhythmias

<table>
<thead>
<tr>
<th></th>
<th>Overall series %</th>
<th>Without LAD %</th>
<th>LAD series %</th>
<th>LAHB series %</th>
<th>LAD without LAHB %</th>
</tr>
</thead>
<tbody>
<tr>
<td>AV block</td>
<td>23.6</td>
<td>23.6</td>
<td>23.4</td>
<td>21.1</td>
<td>30.3</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>12.2</td>
<td>12.7</td>
<td>9.8</td>
<td>10.1</td>
<td>9.0</td>
</tr>
<tr>
<td>Ventricular premature beats</td>
<td>41.8</td>
<td>42.3</td>
<td>39.2</td>
<td>44.9</td>
<td>27.2</td>
</tr>
<tr>
<td>Ventricular tachycardia</td>
<td>14.1</td>
<td>13.1</td>
<td>22.5</td>
<td>24.6</td>
<td>18.1</td>
</tr>
<tr>
<td>Ventricular fibrillation</td>
<td>7.3</td>
<td>7.1</td>
<td>9.8</td>
<td>10.1</td>
<td>9.0</td>
</tr>
</tbody>
</table>
DURATION OF HEMIBLOCK
Transient left anterior hemiblock appeared in 5 cases during the course of myocardial infarction and persisted from 10 hours to 11 days.

ASSOCIATED CLINICAL FEATURES
Other characteristics of the ‘coronary prone’ patient were compared for the groups of patients with and without left axis deviation and left anterior hemiblock (Table 4). There were no significant differences with regard to age, diabetes mellitus, history of previous myocardial infarction, hypertension, cigarette smoking, obesity. It was noted, however, that left axis deviation occurred significantly more often in hypertensive patients over the age of 65 (P < 0.001).

Discussion
Left anterior hemiblock is the most frequent type of intraventricular block found in the course of acute myocardial infarction. Working on this same subject, the incidence reported by Marriott and Hogan (1970) in a series of 250 cases was 15.2 per cent, by Scheinman and Brennan (1972) in a series of 480 cases the incidence was 4 per cent, and by Col and Weinberg (1972) in a series of 225 cases it was 6.2 per cent. In our series of 700 patients isolated left anterior hemiblock developed in 9.9 per cent. The frequent appearance of left anterior hemiblock in acute myocardial infarction is explained by a discrete left anterior fascicle. The thin structure of this fascicle receiving its blood supply mainly from the anterior descending artery is often vulnerable to ischaemic and necrotic insults (Lenegre, 1964; Sutton and Davies, 1968; Massing and James, 1971). If the left anterior fascicle is not a discrete structure an infarction large enough to deviate the axis abnormally leftward could result in a dangerous situation.

It was shown that the occurrence of isolated left axis deviation with or without the criteria for left anterior hemiblock did not increase the rate of mortality. Marriott and Hogan (1970) and Kincaid and Botti (1972) reported earlier also that left axis deviation in the course of acute myocardial infarction had no adverse effect on the prognosis. The reason why left anterior hemiblock is not a serious conduction disturbance is not known, for it would be expected that any type of conduction disturbance occurring in the course of acute myocardial infarction would increase the risk of the disease. Furthermore, it is known definitely that the appearance of complete right bundle-branch block or left bundle-branch block increases the rate of mortality in acute myocardial infarction (Bauer et al., 1965; Hunt and Sloman, 1969; Godman et al., 1970; Norris and Croxson, 1970). In brief, it is suggested that left anterior hemiblock has no adverse effect on mortality because (1) left anterior fascicle has a separate and thin structure differing from the rest of the left bundle, making it vulnerable to only slight ischaemia or necrosis (Massing and James, 1971) and (2) only a small conduction delay which does not lead to prolonged QRS duration should pose no problem (Kincaid and Botti, 1972).

In our patients the development of left anterior hemiblock did not increase the incidence of arrhythmias and particularly the incidence of atrioventricular block. This finding confirms similar earlier reports (Marriott and Hogan, 1970; Col and Weinberg, 1972; Kincaid and Botti, 1972). We compared the development of arrhythmias in 61 patients with acute anterior myocardial infarction with left anterior hemiblock with 262 patients with acute anterior myocardial infarction without intraventricular block. Atrioventricular block in the former group was found in 12 patients (19.7%) and in the latter in 33 (12.6%). The difference between the two groups was not statistically significant. There was also no difference in other types of arrhythmias. Nor did the left axis deviation increase the incidence of arrhythmias.

When other clinical features were compared between the groups with and without left anterior hemiblock and left axis deviation no significant difference was noted, the only difference was the

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**Table 3** Comparison of incidence of arrhythmias in patients with LAHB and without intraventricular conduction defect

<table>
<thead>
<tr>
<th></th>
<th>Anterior MI</th>
<th>Anterior MI without IV conduction defect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>AV block</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>19.7</td>
<td>12.6</td>
</tr>
<tr>
<td>Ventricular premature beats</td>
<td>47.5</td>
<td>50.7</td>
</tr>
<tr>
<td>Ventricular tachycardia</td>
<td>24.5</td>
<td>19.0</td>
</tr>
<tr>
<td>Ventricular fibrillation</td>
<td>6.1</td>
<td>10.3</td>
</tr>
<tr>
<td>Total number</td>
<td>61</td>
<td>262</td>
</tr>
</tbody>
</table>

**Table 4** Comparison of characteristics of patients with and without LAD and LAHB

<table>
<thead>
<tr>
<th></th>
<th>Total series</th>
<th>Without LAD</th>
<th>LAD series</th>
<th>LAHB series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>700</td>
<td>598</td>
<td>102</td>
<td>69</td>
</tr>
<tr>
<td>Average age</td>
<td>57.9</td>
<td>57.4</td>
<td>58.5</td>
<td>58.6</td>
</tr>
<tr>
<td>Diabetes mellitus %</td>
<td>21.0</td>
<td>20.7</td>
<td>22.5</td>
<td>24.6</td>
</tr>
<tr>
<td>Previous MI %</td>
<td>23.4</td>
<td>24.2</td>
<td>18.6</td>
<td>10.1</td>
</tr>
<tr>
<td>Hypertension %</td>
<td>36.2</td>
<td>34.2</td>
<td>48.0</td>
<td>43.4</td>
</tr>
<tr>
<td>Smoking %</td>
<td>78.7</td>
<td>78.4</td>
<td>80.3</td>
<td>72.4</td>
</tr>
<tr>
<td>Obesity %</td>
<td>21.0</td>
<td>20.4</td>
<td>24.5</td>
<td>23.1</td>
</tr>
</tbody>
</table>
frequency of hypertension in patients with left axis deviation over 65 years (P < 0.001). In a similar study (Kincaid and Botti, 1972) cardiomyogal was found to be more frequent in the group with left axis deviation.

In our series 5 instances of transient left anterior hemiblock developed during the course of acute myocardial infarction. Transient left anterior hemiblock was also reported by others in the course of acute myocardial infarction (Rosenbaum et al., 1969b) and as a result of metabolic factors (Deliyannis et al., 1971; Ewy et al., 1971). As reported previously, transient left anterior hemiblock has no adverse effect on the prognosis of the disease.

It is concluded that isolated left anterior hemiblock and left axis deviation complicating acute myocardial infarction are common, occur early during its evolution, may rarely be transient, and do not seem to affect the clinical course or increase the mortality of the disease.

References


Requests for reprints to Professor Kemalettin Büyüköztürk, Division of Cardiovascular Diseases, Department of Internal Medicine, Faculty of Medicine, Istanbul University (Iç Hastaliklari Klinigi), Çapa-Istanbul, Turkey.
Prognostic significance of isolated left anterior hemiblock and left axis deviation in the course of acute myocardial infarction.
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Br Heart J 1977 39: 1192-1195
doi: 10.1136/hrt.39.11.1192

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