The Significance of Second Degree Atrioventricular Block and Bundle Branch Block

Observations Regarding Site and Type of Block

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SUMMARY

His bundle (H) electrograms were recorded in 15 patients with second degree atrioventricular (A-V) block and bundle branch block and these patients were prospectively followed. Site of block was proximal to H in four (BPH), distal to H in nine (BDH), and undetermined in two (studied during 1:1 conduction). Surface electrocardiographic features were retrospectively examined to determine the value of these recordings in predicting the site of block. Patients with type I block, with or without type II or 2:1 block, had BPH. Patients with type II block, 2:1 block, or type II combined with 2:1 block had BDH. Heart failure was more common in those with BPH (three of four patients as compared to three of nine patients with BDH). Syncope developed more commonly in patients with BDH (six of nine patients) as compared to those with BPH (one of four patients). Permanent pacing was indicated in three of four patients with BPH, nine of nine patients with BDH, and one of two patients with block at undetermined site because of syncope or heart failure. Five of nine patients with BDH required pacemakers within ten days of initial admission.

Most patients with second degree A-V block and bundle branch block will need permanent pacing. In patients with 2° BDH, pacemakers are indicated whether or not symptoms are present because of high risk of syncope and potential risk of sudden death. In asymptomatic patients with 2° BPH, careful observation is indicated.

Additional Indexing Words: His bundle electrogram Conduction disease Wenckebach periods Pacemakers Lev's disease Lenegre's disease Mobitz block

It has been suggested that type I second degree block usually occurs in the atrioventricular (A-V) node, reflects a functional disturbance of conduction, and has a benign clinical course.\(^1\ ^2\) In contrast, type II block, is said to reflect bilateral bundle branch block, represents structural disease in the His-Purkinje system, and has a malignant clinical course.

Most observations regarding type I block have been made in patients with narrow QRS and either inferior myocardial infarction or digitalis intoxication.\(^3\ ^4\ ^5\ ^6\ ^7\) Most observations concerning type II block have been made in patients with bundle branch block and massive antero-septal infarction, or in isolated cases with pre-existent bundle branch block.\(^8\ ^9\ ^10\)

The natural history of type I and II block may in fact reflect the clinical circumstances in which these blocks tend to occur, and not the intrinsic behavior of either the type or site of block.

In this study, we have examined the clinical course of patients with second degree A-V block and pre-existent bundle branch block. This group has been chosen for analysis since the wide QRS is consistent with a site of block either proximal to or distal to the His bundle. The group was clinically homogeneous, and thus the influence that the type

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and site of block had on subsequent course could be evaluated. We have also examined the accuracy of surface electrocardiographic criteria in predicting the site of block in this group of patients with second degree block and bundle branch block.

Methods

Definitions

The following electrocardiographic definitions were utilized. Second degree block was defined as incomplete A-V block with dropped ventricular beats. Type I second degree block was characterized by progressive prolongation of conduction intervals preceding the dropped beat, and type II block by fixed conduction intervals for two or more beats preceding the dropped beat. Two to one block was not classified as to type. Left and right bundle branch block were diagnosed using standard electrocardiographic criteria.11 Left anterior and posterior fascicular block were diagnosed utilizing the criteria of Rosenbaum.12

Patient Selection

During the past two years, all electrocardiograms in the West Side Medical Center (University of Illinois Hospital, West Side Veterans Hospital, and Cook County Hospital) have been screened by members of the respective cardiology departments for the presence of conduction disease. This report details our total experience with previously undiagnosed second degree block and bundle branch block, detected in either the medical clinics or the hospital emergency rooms. Although a number of the patients were symptomatic at the time of admission, the presence of this combination of conduction defects, even without symptoms, was considered cause for admission. Specifically excluded from the study group were patients with acute myocardial infarction, and patients with bundle branch block who developed the second degree block pattern while hospitalized for cardiovascular or other disease. Clinical and electrocardiographic data from the study group are summarized in table 1. More detailed analysis of the patients is presented in the appendix.

Electrophysiological Studies

His bundle electrograms were recorded in all patients, usually at the time of temporary pacemaker insertion, with previously described catheter techniques.13,14 Eleven of the patients were in second degree block at the time of study. Four of the patients had 1:1 A-V conduction at the time of study. In two of these, a probable site of second degree block was established utilizing atrial pacing. In the other two patients, a probable site of block could not be delineated.

His bundle electrograms were differentiated from atrial electrograms by noting typical A-H Wenckebach sequences during either spontaneous or atrial paced episodes of type 1 block. His bundle pacing was not utilized for validation.

Patient Follow-up

This study was conducted concomitantly with a large prospective study of patients with bifascicular block and intact conduction. The prospective study of second degree block and bundle branch block was complicated by the fact that only three of the 15 patients were totally asymptomatic when first seen. However, an attempt was made to judiciously define the natural history of second degree block and bundle branch block in both asymptomatic and symptomatic patients. In

Table 1

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Sex</th>
<th>Clinical diagnosis</th>
<th>Type of 2° Block</th>
<th>QRS Complex</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>75</td>
<td>M</td>
<td>Calcific AS</td>
<td>Type I &amp; 2:1</td>
<td>-10° RBBB</td>
</tr>
<tr>
<td>2</td>
<td>52</td>
<td>M</td>
<td>ASHD</td>
<td>Type I &amp; II</td>
<td>-30° LBBB</td>
</tr>
<tr>
<td>3</td>
<td>76</td>
<td>M</td>
<td>ASHD</td>
<td>Type I &amp; II</td>
<td>-150° RBBB</td>
</tr>
<tr>
<td>4</td>
<td>62</td>
<td>M</td>
<td>ASHD, Dig Int</td>
<td>Type I</td>
<td>+100° RBBB</td>
</tr>
<tr>
<td>5</td>
<td>75</td>
<td>M</td>
<td>HCVD</td>
<td>2:1</td>
<td>+90° RBBB</td>
</tr>
<tr>
<td>6</td>
<td>58</td>
<td>M</td>
<td>ASHD</td>
<td>Type II &amp; 2:1</td>
<td>-30° LBBB</td>
</tr>
<tr>
<td>7</td>
<td>78</td>
<td>M</td>
<td>ASHD</td>
<td>Type II &amp; 2:1</td>
<td>-60° LBBB</td>
</tr>
<tr>
<td>8</td>
<td>42</td>
<td>M</td>
<td>AS</td>
<td>2:1</td>
<td>+20° LBBB</td>
</tr>
<tr>
<td>9</td>
<td>41</td>
<td>F</td>
<td>ASHD</td>
<td>Type II &amp; 2:1</td>
<td>+75° RBBB</td>
</tr>
<tr>
<td>10</td>
<td>72</td>
<td>M</td>
<td>ASHD</td>
<td>Type II &amp; 2:1</td>
<td>-10° LBBB</td>
</tr>
<tr>
<td>11</td>
<td>82</td>
<td>M</td>
<td>ASHD</td>
<td>Type II &amp; 2:1</td>
<td>-30° LBBB</td>
</tr>
<tr>
<td>12</td>
<td>80</td>
<td>F</td>
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<td>-75° RBBB</td>
</tr>
<tr>
<td>13</td>
<td>54</td>
<td>M</td>
<td>ASHD</td>
<td>2:1</td>
<td>-10° LBBB</td>
</tr>
<tr>
<td>14</td>
<td>54</td>
<td>M</td>
<td>RHD</td>
<td>Type II</td>
<td>-30° LBBB</td>
</tr>
<tr>
<td>15</td>
<td>51</td>
<td>M</td>
<td>ASHD</td>
<td>Type I &amp; II</td>
<td>-60° RBBB</td>
</tr>
</tbody>
</table>

Abbreviations: M = male; F = female; ASHD = Arteriosclerotic heart disease; AS = Aortic stenosis; HCVD = Hypertensive cardiovascular disease; RHD = Rheumatic heart disease; RBBB = Right bundle branch block; LBBB = Left bundle branch block, and Dig Int = Digitalis intoxication.

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several of the patients, it was obvious, at or soon after admission, that permanent pacing was indicated, based upon either the severity of bradycardia, a history of several syncopal episodes, or evidence of significant congestive failure complicating the bradyarrhythmia. These patients were treated with permanent pacemakers on the initial admission. Those patients in whom initial symptoms did not appear to necessitate permanent pacemaker insertion were discharged after prolonged inpatient monitoring and were followed at close intervals in a conduction disease clinic. Subsequent recurrence of syncope and/or development of congestive failure were considered cause for rehospitalization and implantation of permanent pacemakers. Detailed analysis of follow-up and therapy is presented in the appendix.

Results

Electrophysiological Studies

Four patients were considered to have second degree block at the A-V node (cases 1–4) (table 2). In three of these, spontaneous 2:1 block proximal to H was noted during electrophysiological study. The fourth was considered to have 2:1, A-V nodal block because of prolonged A-H intervals (greater than 130 msec) and development of type I block proximal to H at an atrial paced rate of 100 beats/min. All four of these patients manifested type I block proximal to H during the electrophysiological studies (figs. 1A and 2A). Two of these patients (Cases 2 and 3) had, in addition, episodes of type II block proximal to H (figs. 1B and 2B).

In eight patients, spontaneous second degree block was distal to the His bundle (Cases 5–12). One additional patient (Case 13) was felt to have 2:1 A-V block distal to H because of prolonged H-V interval and development of type II block distal to H at a paced rate of 127/min. All had type II block or 2:1 block during the study (figs. 3 and 4). Seven of these nine patients with 2:1 block distal to H had prolonged H-V intervals (greater than 55 msec). None of these patients had type I block distal to H.

In two patients, site of second degree block was considered undetermined (Cases 14 and 15) because of normal pacing responses at the time of study. One of these had a considerably prolonged H-V interval (73 msec) suggesting bilateral bundle branch disease.

### Table 2

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>A-H (msec)</th>
<th>H-V (msec)</th>
<th>Site of 21 Block</th>
<th>Type of 21 Block during study</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td></td>
<td>Prox</td>
<td>I</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td></td>
<td>Prox</td>
<td>I &amp; II</td>
</tr>
<tr>
<td>3</td>
<td>65</td>
<td></td>
<td>Prox</td>
<td>I &amp; II</td>
</tr>
<tr>
<td>4</td>
<td>48</td>
<td></td>
<td>Prox (at paced rate)</td>
<td>II (at paced rate of 100/minute)</td>
</tr>
<tr>
<td>5</td>
<td>79</td>
<td>51*</td>
<td>Dist</td>
<td>II</td>
</tr>
<tr>
<td>6</td>
<td>90</td>
<td>65*</td>
<td>Dist</td>
<td>II &amp; 2:1</td>
</tr>
<tr>
<td>7</td>
<td>145</td>
<td>75*</td>
<td>Dist</td>
<td>II &amp; 2:1</td>
</tr>
<tr>
<td>8</td>
<td>126</td>
<td>50*</td>
<td>Dist</td>
<td>II</td>
</tr>
<tr>
<td>9</td>
<td>84</td>
<td>65*</td>
<td>Dist</td>
<td>II &amp; 2:1</td>
</tr>
<tr>
<td>10</td>
<td>160</td>
<td>80*</td>
<td>Dist</td>
<td>2:1</td>
</tr>
<tr>
<td>11</td>
<td>60</td>
<td>78*</td>
<td>Dist</td>
<td>II</td>
</tr>
<tr>
<td>12</td>
<td>105</td>
<td>60*</td>
<td>Dist</td>
<td>2:1</td>
</tr>
<tr>
<td>13</td>
<td>93</td>
<td>74</td>
<td>Dist (at paced rate)</td>
<td>II (at paced rate of 127/minute)</td>
</tr>
<tr>
<td>14</td>
<td>88</td>
<td>73</td>
<td>Unknown</td>
<td>Proximal to H (at paced rate of 100/minute)</td>
</tr>
<tr>
<td>15</td>
<td>125</td>
<td>42</td>
<td>Unknown</td>
<td>Proximal to H (at paced rate of 165/minute)</td>
</tr>
</tbody>
</table>

Abbreviations: Prox = Proximal to the His bundle; Dist = Distal to the His bundle, and * = H-V interval of conducted beats.

Figure 1

Case 2. Electrocardiographic rhythm strip V, showing type I second degree atrioventricular (A-V) block and left bundle branch block. There is progressive prolongation of P-R intervals prior to the dropped P wave. Panels A and B are simultaneous His bundle electrograms (HBE) of the same patient. The P waves are labeled A (atrial electrogram), His bundle potentials labeled H, and A-H intervals are listed. Paper speed is 100 mm/sec and timelines are at one second on this and all subsequent illustrations. Panel A) 2:1 A-V block (type I) proximal to H. Note there is progressive prolongation of A-H intervals and the fourth P is blocked proximal to H. Panel B) 2:1 A-V block proximal to H. Here the A-H intervals are relatively constant suggesting type II block.
PROGNOSSES FOR 2° A-V BLOCK AND BBB

Case 3. Rhythm strip V₁, showing type II, 2° A-V block and right bundle branch block. The PR intervals are constant before a dropped P wave. Panels A and B are His bundle electrograms (HBE) of the same patient. ECG leads I, II, III and V₁ are also shown. Panel A) 2° block proximal to H, with gradual prolongation of A-H interval prior to blocked P wave (type I). Panel B) 2° block proximal to H, with fixed A–H interval before the dropped beat (type II). The long A-H interval before the dropped P may reflect repetitive concealed conduction.

Figure 2

Predicting the site of block (table 3). Several features are of interest. Left bundle branch block was more commonly associated with block distal to H, while right bundle branch block was equally associated with block either proximal or distal to H.

All patients with type I block, with or without type II block, and with or without 2:1 block, had a site of block proximal to H (with the exception of one patient with undetermined site of block). In contrast, the site of the block in all patients with type II block alone, or type II with 2:1 block, was distal to H (with the exception of one patient with undetermined site of block). All patients with 2:1 block alone had block distal to H.

Symptoms and Clinical Course

Congestive heart failure occurred more commonly in patients with block proximal to H, with three of four patients (75%) developing this condition as compared to three of nine patients (33%) with block distal to H (P < 0.01) (table 4). Syncope occurred less frequently in patients with block proximal to H occurring in one of four patients, (25%) as compared with six of nine patients (66%) with block distal to H who experienced syncope (P < 0.01).

The site of block was analyzed with respect to the patient’s clinical course. Two of four patients with 2° block proximal to H had a permanent pacemaker inserted. One had congestive heart failure and bradycardia within one month of diagnosis and the other developed syncope at two and a half months after diagnosis. A third patient with second degree block proximal to H developed intermittent complete heart block and congestive heart failure with dizziness one month after diagnosis but has refused pacemaker implantation. One patient has 2° block proximal to H while receiving digitalis. Second degree block has recurred once in this patient three months later while off digitalis. This patient has remained asymptomatic without permanent pacing.

All nine patients with block distal to H required permanent pacemaker implantation. Five required a pacemaker within ten days of admission, three
Table 3

Correlation of Electrocardiographic Features with Site of Block

<table>
<thead>
<tr>
<th>Surface ECG findings</th>
<th>Patients with block proximal to H</th>
<th>Patients with block distal to H</th>
<th>Patients with unknown site of block</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bundle Branch Block</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LBBB (8 pts)</td>
<td>1 (12%)</td>
<td>6 (75%)</td>
<td>1 (12%)</td>
</tr>
<tr>
<td>RBBB (7 pts)</td>
<td>3 (43%)</td>
<td>3 (43%)</td>
<td>1 (14%)</td>
</tr>
<tr>
<td><strong>A-V Block</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type I Block with or without Type II or 2:1 (5 pts)</td>
<td>4 (80%)</td>
<td>0 (0%)</td>
<td>1 (20%)</td>
</tr>
<tr>
<td>Type II Block alone or with 2:1 (6 pts)</td>
<td>0 (0%)</td>
<td>5 (80%)</td>
<td>1 (20%)</td>
</tr>
<tr>
<td>2:1 alone (4 pts)</td>
<td>0 (0%)</td>
<td>4 (100%)</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

Abbreviations: LBBB = Left bundle branch block; RBBB = Right bundle branch block, and Pts = Patients.

with syncope and two with congestive heart failure. Three patients developed syncope at two to four months after diagnosis. The one remaining patient developed congestive heart failure within two months following diagnosis and was treated with permanent pacing.

One of the two patients with an unknown site of block required a pacemaker within three months of diagnosis because of syncope; the other patient who did not need pacemaker implantation has been followed for three months and remains asymptomatic.

Discussion

The electrocardiographic classification of second degree A-V block into Mobitz types I and II is based upon the behavior of PR intervals prior to the dropped beat.\(^5\) Type I block is characterized by progressive prolongation of PR intervals before a blocked P wave, while in type II PR intervals are fixed. McNally et al. and Langendorf et al. suggested that type II block reflected bilateral bundle branch disease with likelihood of progression to higher degree of block.\(^1\)\(^,\)\(^2\) These conclusions were supported by sporadic case reports of patients

Table 4

Correlation Between Site of Block and Clinical Outcome

<table>
<thead>
<tr>
<th>Patient</th>
<th>Site of block</th>
<th>Syncope</th>
<th>Dizziness</th>
<th>CHF</th>
<th>PPMR</th>
<th>Days between diagnosis and PPMR insertion</th>
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<tr>
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<td>-</td>
<td>-</td>
<td>+</td>
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<td>26</td>
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<td>Prox</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>Ind</td>
<td>-</td>
</tr>
<tr>
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<td>Prox</td>
<td>+</td>
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<td>-</td>
<td>Yes</td>
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<td>+</td>
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<td>Dist</td>
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<tr>
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<td>+</td>
<td>+</td>
<td>-</td>
<td>Yes</td>
<td>87</td>
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</tbody>
</table>

Abbreviations: Prox = Proximal; Dist = Distal; Unk = Unknown; CHF = Congestive Heart Failure; PPMR = Permanent Pacemaker Insertion; Ind = Indicated, and Ref = Refused.
with type II block and bundle branch block, or from observations of patients with second degree block and acute antero-septal myocardial infarction.7-10 In contrast, type I block was said to reflect A-V nodal dysfunction, with much less risk of progression of conduction disease. These conclusions were supported by observations in patients with narrow QRS and either digitalis intoxication or acute diaphragmatic infarction.9-7 The clinical course associated with type I and II block may reflect the associated clinical conditions and not the intrinsic behavior of either site or type of block.

The His bundle recording technique has provided a means for delineating the site of block other than the surface electrocardiographic criteria.16-18 His bundle recording in patients with type I block (and generally narrow QRS) has revealed a site of block proximal to the His bundle (A-V node). However, several patients with type I block distal to H have been reported.19-22 All of these patients had antecedent bundle branch block, suggesting that Wenckebach periods were occurring in the contralateral bundle branch.

In most patients studied with type II block the site of block has been distal to the His bundle.16-19 Almost all of these patients have had bundle branch block. Several patients have been described with type II block and narrow QRS, these patients having either block in or proximal to the His bundle.19, 21

Thus, the His bundle recording technique has in general confirmed most previous speculations regarding the relationship between type of block and site of block. However, this confirmation depended primarily upon comparison of patients with type I block and narrow QRS and patients with type II block and wide QRS. The results of the present study in patients with bundle branch block and second degree block also partially confirm previous speculations. Patients with type I block, with or without type II block or 2:1 block, had a site of block proximal to the His bundle. Patients with type II block alone, 2:1 block alone, or type II and 2:1 block had a site of block distal to H.

The presence of bundle branch block in all patients in this series suggested a high risk of bilateral bundle branch disease. Left bundle branch block was associated with a very high incidence of second degree block distal to H, e.g., second degree block distal to H in six of seven patients with LBBB. In contrast, RBBB was associated with an equal incidence of second degree block proximal and distal to H. These findings are consistent with results of His bundle recording in patients with bundle branch block and intact conduction.21, 24, 25 H-V prolongation suggesting bilateral bundle branch disease is frequently seen in patients with left bundle branch block. In addition, pathological studies in patients with left bundle branch block have revealed significant involvement of both bundle branches.26 However, it should be noted that A-V nodal disease can be a cause of second degree block, despite the presence of a bundle branch block, as demonstrated in the present study. This also could be inferred from previous studies in patients with bundle branch block and intact conduction, in that A-H prolongation was frequently found in patients with both right and left bundle branch block.21

There is little reported data concerning the subsequent clinical course of patients with chronic second degree A-V block where site of block has been delineated with His bundle recording. Narula et al. noted that three out of eight patients with type II second degree block distal to H and bundle branch block had complete heart block at six months follow-up.19 However, no data was presented concerning the time of onset of complete block in these patients or regarding the clinical course in the other patients studied. Other authors have recorded His bundle electrograms in selected patients with 2° A-V block and syncopal attacks, and demonstrated sites of block in or distal to the His bundle.27, 28 However, there have been no previously reported attempts utilizing prospective follow-up to determine the natural history of second degree block as related to site of block.

Again, our results partially confirm previous speculations.1, 2 Our patients with second degree block distal to H and bundle branch block had a serious prognosis. All nine needed pacemakers, in six because of syncopal episodes. It should be specifically noted that absence of syncope at the time of initial diagnosis did not negate the later occurrence of syncope. Our results in patients with bundle branch block and second degree block proximal to H were somewhat surprising in that three of four of these patients also needed pacemakers. The clinical course in the patients with second degree block proximal to H was, however, somewhat less hectic than patients with chronic distal block. Syncope was less common in this group, and heart failure more common. Despite the higher incidence of heart failure, digitalis intoxication could be implicated in only one of the patients who has not needed a pacemaker. Even in this
latter patient, the subsequent development of asymptomatic second degree block when off digitalis suggested the presence of chronic A-V nodal disease.

These results concerning correlation of clinical features and site of block are in keeping with our previous observations made in 49 patients with complete heart block.\textsuperscript{28} Congestive heart failure was found to be more common in patients with complete block proximal to or in the His bundle, while syncope was found to be more frequent in patients with block distal to H.

Conclusions

The following conclusions are suggested by this study. Second degree block complicating bundle branch block may be either proximal or distal to the His bundle, the latter being more common. Type I block in any combination with type II block or 2:1 block suggests the presence of proximal block. The presence of left bundle branch block and type II block alone, or in combination with 2:1 block, or 2:1 block alone, suggests block distal to H.

The clinical course in most patients with second degree block and bundle branch block will be malignant, with most patients needing pacemakers whether block is proximal or distal to the His bundle. Patients with block distal to H will have a higher incidence of syncope. We would recommend the following regarding management of patients with second degree block and bundle branch block. All patients with symptomatic second degree block and bundle branch block should be treated with permanent pacemakers, unless there is an obvious reversible cause of block such as digitalis intoxication. In asymptomatic patients with bundle branch block and second degree block, those with a site of block proximal to H can be followed closely, and pacemakers inserted if symptoms develop. In patients with block distal to H, pacemaker insertion is indicated because of the high incidence of syncope and potential risk of sudden death.

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Appendix

Case 1

The patient was a 75 year old male with calcific aortic stenosis, mild congestive heart failure, and type I and 2:1 block with right bundle branch block (RBBB) admitted from clinic on 7/3/72. Electrophysiological studies on 7/6 revealed second degree block proximal to H. A permanent pacemaker was implanted on 7/29 because of persistent second degree block with congestive heart failure. The patient expired on 10/5/72 with chronic uremia.

Case 2

The patient was a 52 year old male with arteriosclerotic heart disease (ASHD), congestive failure (CHF), type I and II second degree A-V block with LBBB, admitted on 9/14/72. He had been receiving 0.25 mg of digoxin per day prior to admission. Electrophysiological studies on admission revealed type I and II block proximal to H. Digoxin was discontinued but 2° block persisted. Permanent pacemaker was advised because of persistent block with CHF, but refused by the patient. The patient has been subsequently followed in clinic. In October 1972, he complained of dizziness and cardiogram revealed complete heart block with a ventricular escape rate of 30/min. The patient has still refused a pacemaker.

Case 3

The patient was a 76 year old asymptomatic male with arteriosclerotic heart disease admitted on 2/2/72 because of type I & II block with RBBB detected during a routine clinic visit. Electrophysiological studies on admission revealed 2° block proximal to H. The patient was discharged on 2/3/72 and followed in clinic. On 4/20/72, the patient had a syncopal episode. Similar electrophysiological findings were demonstrated and permanent pacemaker was implanted.

Case 4

The patient was a 62 year old male with ASHD, CHF, and type I block with RBBB admitted on 9/25/72. He had been receiving 0.25 mg of digoxin per day prior to admission. Digoxin was discontinued and A-V conduction returned. Electrophysiological studies on 9/28/72 revealed a prolonged A-H. Type I second degree block proximal to H was noted at a paced atrial rate of 100/min, suggesting that 2° block had been A-V nodal. The patient was discharged on 10/5/72. Second degree block has been noted only on one occasion (12/14/73) during a treadmill exercise test. The patient has remained asymptomatic.

Case 5

The patient was a 75 year old male with hypertensive cardiovascular disease, recurrent syncope, and 2:1 A-V block with right bundle branch block admitted on 7/11/72. Electrophysiological studies on admission revealed type II block distal to H. A temporary pacemaker was inserted on admission and a permanent pacemaker was implanted on 7/19/72.

Case 6

The patient was a 58 year old male with arteriosclerotic heart disease, congestive heart failure, and type II and 2:1 A-V block with left bundle branch block, admitted on 6/5/72. Electrophysiological studies on admission revealed 2° block distal to H. A permanent pacemaker was implanted on 6/8/72 because of congestive heart failure and bradycardia.

Case 7

The patient was a 78 year old male with ASHD, syncope, and type II and 2:1 A-V block with left bundle branch block, admitted on 10/15/71. Electrophysiological studies on admission revealed spontaneous type II and 2:1 A-V block distal to H. The patient refused permanent pacemaker and was followed in clinic with persistence of 2° A-V block. On 12/3/71, a permanent pacemaker was implanted for dizziness and syncope.

Case 8

The patient was a 42 year old asymptomatic male with a prosthetic aortic valve, and 2:1 A-V block with left bundle branch block, admitted on 7/17/72. Electrophysiological studies on admission revealed type II block distal to H. The patient was discharged with stable 2:1 block. On 10/10/72, the patient had a syncopal episode. A permanent pacemaker was implanted on the same day.

Case 9

The patient was a 41 year old female with ASHD, dizziness, CHF and type II and 2:1 A-V block with right bundle branch block admitted on 12/2/71. Electrophysiological studies on admission revealed 2° block distal to H. A

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temporary demand pacemaker was inserted at that time. Three days after the pacemaker insertion, electrocardiogram revealed 1:1 A-V conduction which persisted for several days. At the patient’s insistence, the pacemaker was removed. Two months later, dizziness recurred and ECG revealed intermittent complete heart block. A permanent pacemaker was implanted on 2/4/72, with relief of symptoms.

Case 10

The patient was a 72 year old male with ASHD, congestive heart failure, type II and 2:1 A-V block with left bundle branch block, admitted on 5/2/72. Electrophysiological studies on admission revealed 2:1 block distal to His bundle. A permanent pacemaker was implanted on 5/8/72 because of bradycardia and congestive failure.

Case 11

The patient was an 82 year old male with ASHD, recurrent syncope and type II and 2:1 A-V block with left bundle branch block, admitted on 8/9/72. Electrophysiological studies on admission revealed 2:1 block distal to H. A permanent pacemaker was implanted on 8/18/72.

Case 12

The patient was an 80 year old female with hypertensive cardiovascular disease, recurrent syncope and 2:1 A-V block with right bundle branch block, admitted on 3/19/73. Electrophysiological studies revealed a ventricular rate of 35 and 2:1 A-V block distal to H. A permanent pacemaker was implanted on 3/22/73.

Case 13

The patient was a 54 year old male with arteriosclerotic disease, dizziness and 2:1 A-V block with left bundle branch block admitted on 5/31/72. 1:1 A-V conduction returned within 24 hours. Electrophysiological studies on 6/2/72 revealed intact A-V conduction, with an A-H of 93 msec and a H-V of 74 msec. The patient developed type II block distal to H at a paced rate of 127/min. The prolonged H-V and development of 2° block distal to H with pacing suggested that spontaneous 2° block had been distal to H. Since 1:1 conduction had returned, the patient was discharged and remained asymptomatic without recurrence of A-V block for four months. On 10/8/72, the patient had a syncopal episode. Admission electrocardiogram revealed LBBB with intact conduction. A permanent pacemaker was implanted. The patient has subsequently remained asymptomatic.

Case 14

The patient was a 54 year old asymptomatic male with rheumatic heart disease, admitted 1/10/73 for evaluation of conduction disease. Routine clinic electrocardiogram had revealed one episode of type II block with left bundle branch block. No other episode of 2° block has been noted. Electrophysiological studies revealed 1:1 conduction with an A-H interval of 88 msec and an H-V of 73 msec. Type I block proximal to H was noted at a paced rate of 160/min. The patient has remained asymptomatic.

Case 15

The patient was a 51 year old male with ASHD, one syncopal episode, and right bundle branch block with left anterior hemiblock, admitted on 12/29/72. Electrophysiological studies on admission revealed an A-H interval of 125 msec and an H-V of 42 msec. Type I 2° block was noted at a paced rate of 165/min. He was discharged and readmitted again on 3/16/73 for recurrent dizziness and chest pain. ECG was unchanged from the previous admission. The patient exhibited type I and II 2° block with continuous tape monitoring (Holter) during hospitalization. A permanent pacemaker was implanted on 3/26/73.
The Significance of Second Degree Atrioventricular Block and Bundle Branch Block: Observations Regarding Site and Type of Block

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