Complete Heart Block Complicating Acute Myocardial Infarction

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Abstract

Complete heart block (CHB) developed in 10.3% of patients with acute myocardial infarction (MI). It was more frequent among patients with inferior myocardial infarction compared to anterior myocardial infarction, but the mortality was significantly high among patients with anterior MI who developed CHB.

A new classification into primary (P) and secondary (S) CHB is suggested by the sequence of events. The incidence and mortality of SCHB was significantly high when compared to the incidence and mortality of PCHB.

Wide QRS complexes, a heart rate of less than 60/min, and syncopal attacks were the grave prognostic signs. Progression from a lesser degree of AV block and regression of CHB to a lesser degree of AV Block were both observed in 25.8% cases. Circulatory failure in the form of shock, hypotension, congestive heart failure, and left ventricular failure, alone or in combination was a factor in 17 of the 22 patients who died. Four of 5 patients who underwent transvenous pacing also died.

Introduction

The management of patients with AV block is constantly evolving. A few years ago in most coronary care units it was the policy to place temporary transvenous pacing electrodes in patients who showed any sign of AV block. However it was subsequently seen that most patients who develop AV block associated with inferior infarction recover uneventfully, even without the use of pacemakers. It was also the prevailing opinion that mortality was high among patients with AV block that occurred secondary to anterior myocardial infarction. It is still a matter of controversy whether the mortality is influenced by pacing.

This communication details our experience with the natural history of 31 cases of complete heart block developing as a complication of acute myocardial infarction.

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Materials and Methods

We studied 31 patients in whom complete heart block (CHB) developed from electrocardiographically proved myocardial infarction (WHO Criteria).[1] Each patient was generally monitored continuously for at least 72 hours in the coronary care unit (CCU), except in certain patients with major complications for whom the stay was prolonged. These patients were then followed in the general ward.

The CCU was set up so that each patient had a peripheral module with a relay to the central station. The ECG of every patient could be monitored simultaneously and continuously at the central station, automatic recording was possible whenever arrhythmia developed. Apart from monitoring, the ECG of each patient was recorded on admission and frequently whenever necessary in CCU.

Treatment of patients in the CCU was mainly governed by one physician. Myocardial infarction and its other complications were treated in the usual way. For CHB, sublingual isoprenaline and parenteral alupent were used. Corticosteroids were given in heavy doses. Transvenous pacing was done in five cases.

Results

Complete heart block (CHB) developed in 31 of 300 cases of acute myocardial infarction (10.3%). The age of the patients ranged from 39 to 76 years, with an average of 53 years. Twenty-two of 31 patients (71.0%) were below the age of 60 years. Twenty-nine were men and 2 were women.

Cases of CHB were classified on the basis of sequence of events and development into primary and secondary (Table 1). Patients in whom CHB developed following fascicular blocks or gradually increasing block at the AV node were classified as secondary CHB (SCHB), and patients in whom CHB developed suddenly as a first event and had no evidence of fascicular involvement or AV node involvement were classified as primary CHB (PCHB). Nine of the 31 patients (29.0%) had PCHB, and the other 22 (71.0%) had SCHB. SCHB was secondary to fascicular block in 21 cases and secondary to AV node defect in one.

Of the 31 patients with CHB, 22 died, making the mortality rate 70.9%. Mortality was significantly higher among patients with SCHB compared to PCHB (Table 2).

TABLE 1
Suggested Classification for Complete Heart Block

1. Primary CHB
2. Secondary CHB
   A. Secondary to fascicular blocks
   B. Secondary to AV node defect

CHB was more frequent among cases of inferior myocardial infarction compared to anterior myocardial infarction, but the mortality was significantly higher ($P = 0.05$) among cases of anterior myocardial infarction compared to inferior myocardial infarction (Tables 3 and 4).

In 19 of 31 cases (61.3%) CHB developed in 24 hours. It appeared on second day in 9 patients and on third day in 3. Thus in 61.3% cases CHB developed within 24 hours, and in 90.3% cases within 48 hours (Figure 1).

Eleven of 31 patients with CHB had narrow QRS complexes, and 20 had wide QRS complexes. Mortality was significantly higher ($P < 0.05$) among those with wide QRS complexes (95.0%) compared to narrow QRS complexes

TABLE 2
Classification of CHB Relation to Incidence and Mortality

Classification	Incidence		Mortality	
	No. of Cases	(%)	No. of Cases	(%)
1. CHB	9	(29.0)	2	(22.2)
2A. SCHB secondary to fascicular block	21	(67.7)	19	(90.5)
2B. SCHB secondary to AV node defect	1	(3.2)	1	(100.0)
Total	31	(100.0)	22	(70.9)

The statistical difference in mortality between PCHB and SCHB is highly significant ($P < 0.001$).

TABLE 3
Incidence and Mortality in Relation to Site of Infarction

Site of Infarction	Incidence			Mortality		
	Total No. of Cases	No. of Cases with CHB	(%)	Total No. of Cases with CHB	No. of Deaths	(%)
Anterior MI	220	19	(8.6)	19	17	(89.5)
Inferior MI	80	12	(15.0)	12	5	(41.6)
Total	300	31	(10.3)	31	22	(70.9)

The statistical difference in mortality between anterior infarction and inferior infarction is significant ($P < 0.05$).

TABLE 4
Mortality in Relation to Site and Classification of Infarction

Site	Total Cases			PCHB			SCHB		
	No. of Cases	No. of Deaths	(%)	No. of Cases	No. of Deaths	(%)	No. of Cases	No. of Deaths	(%)
Anterior MI	19	17	(89.5)	3	1	(33.3)	16	16	(100.0)
Inferior MI	12	5	(41.6)	6	1	(16.6)	6	4	(66.6)
Total	31	22	(70.9)	9	2	(22.2)	22	20	(90.0)

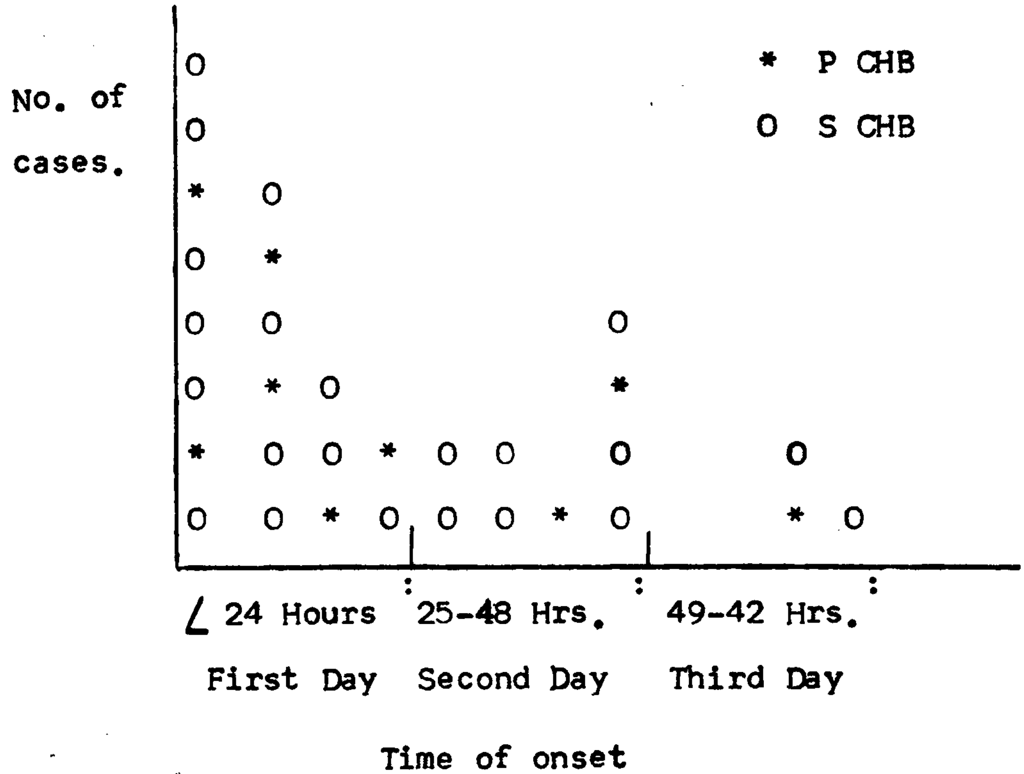

FIG. 1. Time of onset of CHB.

(27.2%) (Table 5). Mortality was significantly higher among patients with CHB with a heart rate less than 60, compared to patients with a heart rate higher than 60/min (Table 6).

Syncopal attack was the presenting sign in 54.8% of the CHB patients; 77.8% of those with PCHB were nonsyncopal, and 66.8% of those with SCHB did present with syncopal attacks. All but 1 patient who presented with a syncopal attack, irrespective of the type of CHB, died. On the other hand, none of the patients with PCHB who presented as nonsyncopal cases died (Table 7).

The sequence of events in 31 cases of CHB is shown in Figure 2. Lesser degree of AV block progressed to CHB in 8 patients (25.8%), of whom 7 had

TABLE 5
Mortality in Relation to Shape of QRS Complex

Shape of QRS	No. of Cases	No. of Deaths	Mortality (%)
Narrow	11	3	27.2
Wide	20	19	95.0
Total	31	22	70.9

Difference is statistically significant ($P < 0.05$).

TABLE 6
Mortality in Relation to Heart Rate

Heart Rate per Minute	No. of Cases	No. of Deaths	Mortality (%)
Less than 60	21	17	80.9
More than 60	10	5	50.0
Total	31	22	70.9

fascicular block. Regression from CHB to first-degree heart block was also observed in 8 patients (25.8%). In 3 patients CHB regressed to Mobitz type II block, but they again developed CHB in 2–4 hours.

Circulatory failure in the form of shock, hypotension, and heart failure, alone or in combination, was present in 17 of the 22 patients who died. Ventricular tachycardia and ventricular fibrillation were the cause of death in 6 (Table 8). In 1 patient CHB regressed to first-degree AV block, then to NSR. He died after developing ventricular extrasystoles that precipitated ventricular tachycardia.

Transvenous pacing was done in 5 patients. Four of the 5 had synocopal attacks and anterior myocardial infarction. All four died. The one survivor had inferior myocardial infarction.

Discussion

Complete heart block was more common in cases of inferior myocardial infarction than in cases of anterior myocardial infarction, whereas mortality was significantly higher among cases of anterior myocardial infarction. These facts have been well established by various workers.[2-7] It is clear that the

TABLE 7
Incidence and Mortality in Relation to Presentation and Type of Infarction

		Syncopal				Nonsyncopal			
		Incidence		Mortality		Incidence		Mortality	
Type of CHB	No. of Cases	No. of Cases	(%)	No. of Deaths	(%)	No. of Cases	(%)	No. of Deaths	(%)
1. PCHB	9	2	(22.2)	2	(100.0)	7	(77.8)	0	(0.0)
2A. SCHB—FB	21	14	(66.6)	13	(92.0)	7	(33.3)	6	(85.7)
2B. SCHB—AVN	1	1	(100.0)	1	(100.0)	0	(0.0)	0	(0.0)
Total	31	17	(54.8)	16	(94.1)	14	(45.0)	6	(42.8)

The difference in mortality between cases with syncopal attacks and nonsyncopal cases is statistically significantly ($P < 0.05$).

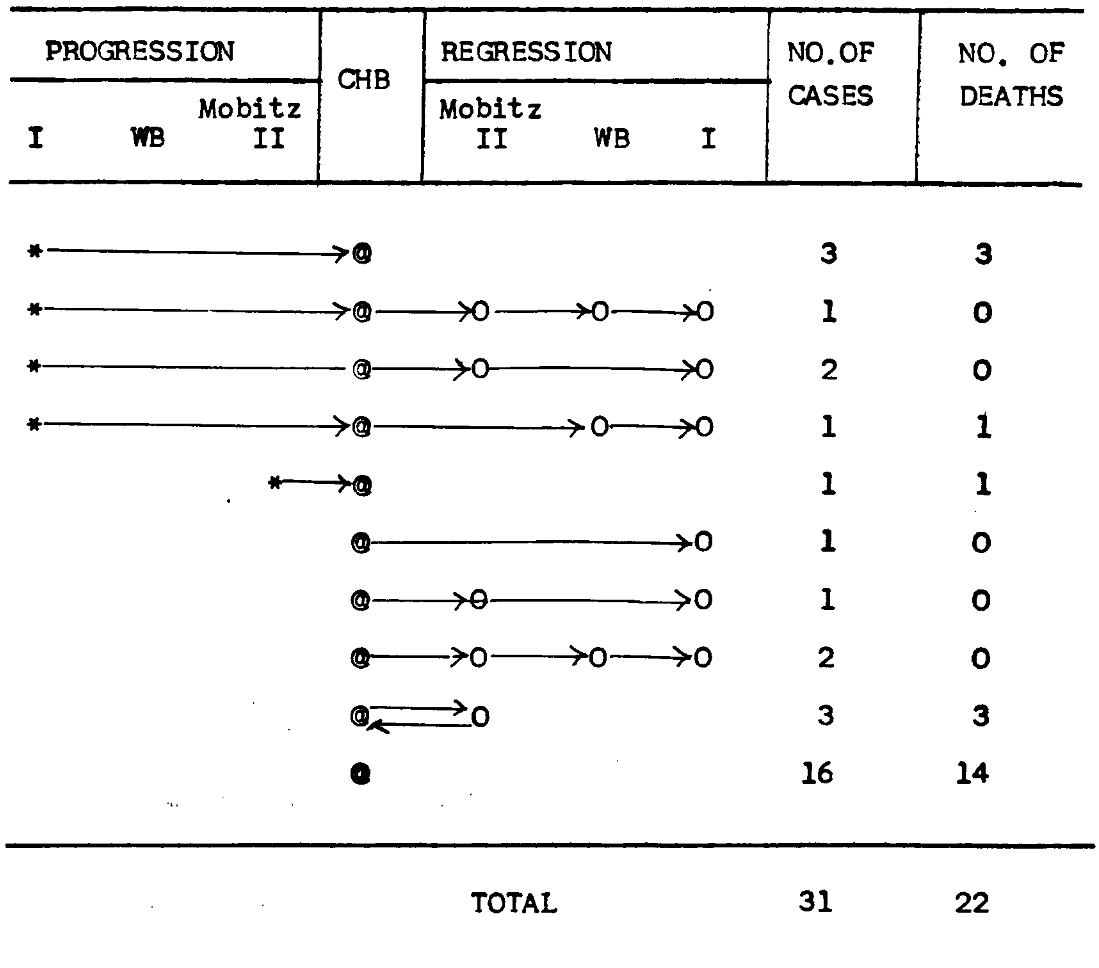

FIG. 2. Natural history of CHB.

pathologic basis of inferior myocardial infarction is different from that of anterior wall infarction.[8]

In inferior wall infarction, reversible ischemic damage occurs to the AV node and the proximal bundle of His, and as a result progression and regression on complete heart block occur in a sequential fashion (Figure 2). Pathologically, however, the AV node is normal, and only small foci of necrosis are found in the bundle branches.[8] Therefore, permanent functional impairment of AV Conduction is unlikely.[8]

When complete heart block develops in anterior wall infarction, it is almost invariably preceded by bundle branch block. Thus we have termed it secondary CHB. That 16 of 19 patients with anterior wall infarction developed complete heart block secondary to fascicular block supports the validity of this terminology. It is further supported by reports of bundle branch block preceding complete heart block in 26 of 27 cases,[9] and in all of another eight cases.[10]

TABLE 8

Cause of Death and Associated Circulatory Status

Cause of Death	No. of Deaths
Shock	5
Shock and CHF and/or LVF	3
CHF and/or LVF	4
VT	1
VT and shock	1
VF and shock	2
VF and CHB	2
CHB alone	4
Total	22

Pathologic studies have clearly shown that the AV node is essentially normal in such cases, but there are extensive area of necrosis in both bundle branches.[8,11] Because of extensive area of necrosis, mortality is very high in these patients, and there is a great risk of permanent block in the patients who survive. None of our patients with anterior myocardial infarction developed complete heart block as a progression from a lesser degree of block without bundle branch block. This fact further supports the view that the AV node is essentially normal.

Analysis of the cases of CHB in the present study has brought out certain factors of great prognostic significance. First, the site of infarction influences the prognosis. For example, 17 of 19 patients with anterior myocardial infarction died, whereas only 5 of 12 patients with inferior infarction died. Second, the type of CHB is equally important, because 20 of 22 patients with secondary CHB died, whereas only 2 of 9 patients with complete heart block expired. Third, Stokes-Adam attacks can be regarded as significant because 16 of 17 patients with syncopal attacks died, whereas only 6 of 14 patients who were nonsyncopal died. Fourth, the shape of the QRS complex can be regarded as a significant prognostic point in that 19 of 20 patients with wide QRS complexes died, whereas only 3 of 11 patients with narrow QRS complexes died. Fifth, heart rate is probably an important factor because 17 of 21 patients with a heart rate less than 60/min died compared to 5 of 10 patients with a heart rate of more than 60 per minute. Sixth, circulatory failure in the form of shock, hypotension, left ventricular failure, and congestive heart failure was present in 17 of 22 patients who died. Only 2 patients with congestive heart failure survived. Thus circulatory failure was one of the important determinants of prognosis.

Heart block develops early in cases of acute myocardial infarction.[12,13] In this study heart block developed in 61.3% cases in less than 24 hours, and in less than 48 hours in 90.3% cases.

Persistent CHB affected 2 of 9 survivors (22.2%) in the present series. Paulk and Hurst[14] reported persistent CHB in 25% of the survivors in their series. Similar observations of persistent heart block have been made by other workers.[12,15,16] These observations are in sharp contrast to those of Ghose[7] and Lassers and Juligan,[9] who did not observe persistent heart block in any case. In 7 of the survivors normal AV conduction returned within 7 days (Figure 2).

Transvenous endocardial pacing is now the most popular mode of therapy for heart block in myocardial infarction, but the reported series[4,17,18] do not support the claim that the outcome is more favorable in patients treated with pacemakers. Forty-two per cent of the patients of Sowton[17] 50% of Friedberg,[4] and 32 of 39 patients of Kimball and Killip[18] died. In the present series, 5 patients were paced; of these, 4 patients with anterior infarction and syncopal attacks died. The one who survived had a nonsyncopal inferior infarction.

In one patient who died, sinus rhythm followed regressive changes, and ventricular ectopia precipitated ventricular tachycardia. A similar case was described by Linenthal and Zoll.[19]

The outcome of patients with complete heart block complicating myocardial infarction appears to depend mainly on the extent of myocardial damage with its associated complications like circulating failure and various arrhythmias. The available electrical and drug treatments do not appear to be of much help, except in a few patients in whom slow heart rate alone is responsible for clinical deterioration.

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