Atrial fibrillation in bacterial endocarditis

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Sixty-nine cases of subacute bacterial endocarditis seen between 1960 and 1967 were analysed to find out the frequency of coexistent atrial fibrillation. Electrocardiographic evidence of atrial fibrillation was found in 26 per cent of all cases. It was commonest in the elderly and carried a poor prognosis. The increased frequency is attributed to the increased average age of patients with subacute bacterial endocarditis, and the increased importance of degenerative heart disease as an underlying cause.

It is widely believed that subacute bacterial endocarditis and atrial fibrillation are very rarely found in the same patient. The older reports emphasize this point (Horder, 1926; Libman and Friedberg, 1941), and even attach diagnostic significance to it. In view of the changes that have occurred in the picture of endocarditis in the past two to three decades (Anderson and Staffurth, 1955; Hughes and Gauld, 1966; Lerner and Weinstein, 1966), a survey was carried out on all cases of subacute bacterial endocarditis admitted to this hospital during the years 1960-1967, in order to discover the frequency of coexistent atrial fibrillation.

Methods

All cases admitted and diagnosed as subacute bacterial endocarditis were analysed. The diagnosis was only accepted if one or more of the following criteria were present: (a) necropsy evidence, (b) typical clinical picture and positive blood culture, (c) typical clinical picture and response to therapy. The diagnosis of atrial fibrillation was only accepted on electrocardiographic evidence.

Results

Sixty-nine cases were found to fulfil one or more of the criteria above, for the diagnosis of endocarditis. Of the 69 cases, 59 were accepted on the first two criteria above, and 10 on the third criterion. There were 18 cases with electrocardiographic evidence of atrial fibrillation, that is 26 per cent of the total. Accurate timing of the onset of atrial fibrilla-

tion was not always possible, but of the 18 cases, 9 were in this rhythm at the time of admission to hospital. The other 9 either developed the arrhythmia after admission to hospital, or had an episode of fibrillation with reversion to sinus rhythm spontaneously or on medical treatment.

The age incidence of all patients in the series is shown in Table 1 which also includes for comparison the age incidence of patients with atrial fibrillation. Most patients in the series were elderly and the maximum incidence fell between the ages of 50 and 59 years. Atrial fibrillation only occurred in patients above the age of 40, and became increasingly common with increasing age. The average overall age of patients was 47 years, while the average age of patients with atrial fibrillation was 60 years, and 83 per cent of these were above the age of 50. The sex incidence of those with atrial fibrillation was equal whereas the overall incidence was 3 male to 2 female patients.

TABLE 1 Age incidence of all patients and of those with atrial fibrillation

Age (yr)	Whole series		Patients with atrial fibrillation	
	No. of patients	Per cent of total	No. of patients	Per cent of total
0-9	1	< 1	0	0
10-19	5	7	0	0
20-29	6	9	0	0
30-39	10	14	0	0
40-49	10	14	3	16
50-59	22	32	6	33
60-69	9	13	4	22
70-79	6	9	5	29

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Underlying pathology It was not possible to be sure of the underlying cardiovascular pathology in a large number of cases as necropsy evidence was not necessarily available. Cases were therefore divided into those with pure valvular disease of the heart, not necessarily rheumatic in origin, and others. This is shown in Table 2. Of the 69 cases, 57 had pure valvular heart disease, and the other 12 had some form of congenital heart disease. In the first group, 44 per cent had pure mitral valve involvement, 35 per cent aortic valve involvement, and 21 per cent a mixture of aortic and mitral valve involvement. All cases with atrial fibrillation had pure valvular disease except one with necropsy evidence of vegetation on a patent foramen ovale. Of the other 17, 10 had mitral valve disease, 6 aortic valve disease, and one had disease of both valves.

Mortality The overall mortality in the whole series was 36 per cent. No deaths occurred before the fourth decade, and most were in older patients. In those with atrial fibrillation, the mortality was 50 per cent, and again it increased with age. The mortality in this group was higher than in those of the same age in sinus rhythm, who had a mortality of 40 per cent.

Discussion

Surveys on subacute bacterial endocarditis before the antibiotic era all emphasize how rare is the association with atrial fibrillation. Its presence or absence is given considerable diagnostic importance. In recent years, it has become clear that the disease we are now seeing is different in many respects from what was seen formerly. Representative examples from a very large volume of published material at that time show that the maximum incidence of subacute bacterial endocarditis fell approximately between the ages of 15 and 40 (Horder, 1909; Libman and Friedberg, 1941; Perry, 1936). The underlying cardiovascular disease in the majority of cases was rheumatic heart disease, and secondly congenital heart disease (Clawson, 1948; Horder, 1909; Libman and Friedberg, 1941; Perry, 1936). In these two respects alone, age and underlying cardiovascular pathology, the disease has changed fundamentally in recent years. The average age of patients has considerably increased, and instead of being a disease of the young, it is increasingly the elderly who are at risk nowadays. Rheumatic heart disease, which used to be such an important cause, is now much less so, and its place has been taken to a

TABLE 2 *Location of lesion in patients with pure valvular disease*

<i>Lesion</i>	<i>No. of patients</i>	<i>Per cent</i>
Mitral valve	25	44
Aortic valve	20	35
Mitral and aortic	12	21
Total	57	100

large extent by various forms of degenerative heart disease. These points have been brought out in recent surveys (Hughes and Gauld, 1966; Lerner and Weinstein, 1966; Shinebourne *et al.*, 1969). The changing age pattern is illustrated in series from this hospital; in 1944, Bayliss found only one case above the age of 50; reviewing cases between 1946 and 1954, Anderson and Staffurth (1955) found 33 per cent of cases were above 50, while in the present series, which covers most of the last decade, 54 per cent of cases were above 50 years.

The total incidence of atrial fibrillation in this series was high, and two other recent series (Staffurth, 1969; Hayward *et al.*, 1969), which also emphasize the increasing age incidence of bacterial endocarditis, mention that atrial fibrillation was found on admission in 10 per cent of cases. This figure compares quite well with this series, where 13 per cent were in atrial fibrillation on admission, though the percentage was doubled by those in whom the arrhythmia developed later in their disease. The first author to question the long-held belief in the rarity of the coincidence of atrial fibrillation and endocarditis was McDonald in 1946. He reviewed 7 studies between the years 1923 and 1941, and found an incidence of 2.45 per cent, but in a necropsy study of his own, he found an incidence of 12.59 per cent. These surveys which reported such a low incidence of atrial fibrillation were obviously describing the situation at the time, so the association was clearly then very rare, and this at a time when rheumatic heart disease, a common cause of atrial fibrillation, was also the commonest cause of subacute bacterial endocarditis. McDonald's explanation of this paradox was as follows: in the days before antibiotics, subacute bacterial endocarditis was an almost universally lethal disease (Horder, 1926; Lichtman, 1943); as atrial fibrillation tended to occur in rheumatic heart disease of long duration, and subacute bacterial endocarditis early on in its natural history, death from sepsis intervened before atrial fibrillation had a chance to appear. The inference is that if endocarditis were seen later on in the natural history of rheu-

matic heart disease, atrial fibrillation would be found more frequently. The overall proportion of cases above the age of 50 in the present series was 54 per cent against 22.46 per cent in McDonald's series. Most patients in his series with atrial fibrillation were above the age of 50, and this is reflected in the present series where 15 out of 18 cases were above 50 years of age, and no case was seen below the age of 40. The much increased incidence of atrial fibrillation in the present series, where it occurred in 26 per cent of cases against 12.59 per cent in McDonald's series, could then be explained by the greater average age of patients in this series. Older patients, with longstanding rheumatic heart disease, could be more likely to be in atrial fibrillation, while the younger age group, diagnosed early on in the natural history of their disease, would tend to be in sinus rhythm. This younger age group, now the minority, would correspond to the majority of cases seen in the preantibiotic era.

The increase in the incidence of atrial fibrillation in this series is far higher than can be explained by postulating merely that a greater number of patients had longstanding rheumatic heart disease, for not only is rheumatic heart disease now a much less common cause, but it is precisely in the older patient that other causes have become more important. It was in the older patients predominantly that atrial fibrillation was found in the series. The reason is probably that various forms of degenerative heart disease are frequent in this age group both as a cause of subacute bacterial endocarditis (Lerner and Weinstein, 1966), and as an unrelated or coincidental disease, and as atrial fibrillation is a common accompaniment of these diseases, its presence in the patient with endocarditis is not now at all uncommon.

This series confirms the high mortality of bacterial endocarditis, a point stressed recently by several authors (Hayward *et al.*, 1969; Lee, 1969; Staffurth, 1969). It was hoped in the early antibiotic era that bacterial endocarditis would prove to be a curable disease, but this has not been realized though the situation is incomparably better than it used

to be before specific therapy appeared, and younger patients seldom need die nowadays. Mortality in patients with atrial fibrillation was particularly high, probably in part because they tended to be older and also because of the increased severity of underlying heart disease when this rhythm disturbance was present.

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