Kawaaski Med. J. Vol. 3: No. 3, 201-208, 1977

EFFECT OF ETIOLOGY, AGE AND LEFT ATRIAL SIZE ON F-WAVE AMPLITUDE OF ATRIAL FIBRILLATION

Keiichi MIZUTANI* and Toshitami SAWAYAMA

Division of Cardiology, Department of Medicine, Kawasaki Medical School, Kurashiki, 701-01, Japan

Acccepted for Publication on 18, April, 1977

Abstract

Since there have been no available reports on a relation of the f-wave size to left atrial dimension (LAD) in atrial fibrillation (Af), 31 patients with Af were selected and divided into two groups according to presence or absence of mitral valve disease (MVD) in order to measure f-wave amplitude in lead V_1 on electrocardiogram and LAD measured on echocardiogram.

While the age between the two groups did not differ significantly, there was a significant difference ($p < 0.05$) in f-wave size and LAD between the two groups. Both f-wave size and LAD were found to be significantly large in the group with MVD. While the correlation of age with f-wave size and with LAD was poor, that of f-wave size with LAD between the two groups was weakly positive ($r = +0.53$).

It may, therefore, be postulated that in patients with MVD and with large f-wave the left atrium is enlarged, and that most of patients with f-wave size of greater than 1.5 mm or with LAD over 40 mm have MVD.

INTRODUCTION

It is generally believed[1,2] that the f-wave of atrial fibrillation (Af) in mitral valve disease (MVD), especially in mitral stenosis (MS), is coarse in size. This seems to be related to the large left atrial size in this condition, but since there has been no quantitative study, its reliability was investigated.

SUBJECTS

Cases selected for the present study were 31 patients of atrial fibrillation from whom both electrocardiogram and echocardiogram were

* This study was carried out during his rotating redidency at the Division of Cardiology.

水谷敬一，沢山俊民

taken, and they were classified into two groups. Group A consisted of 20 Af cases accompained by MVD [11 of MS, 3 of mitral regurgitation (MR), 5 of MS + MR, and 1 of MS + aortic regurgitation (AR) with aortic stenosis (AS)].

Group B (without MVD) consisted of 11 Af cases with 3 of ischemic and/or hypertensive heart disease, 5 of myocardial disease, 1 of hyperthyroidism, 1 of congenital heart disease and 1 of no demonstrable heart disease.

METHOD

For the measurement of f-wave size, 5 f-waves of large amplitude were selected in lead V_1 of the electrocardiogram (Fig. 1) and the average value was calculated. The left atrial dimension (LAD) was measured on echocardiogram (Fig. 2), which has been reported to be well correlated with angiographically documented left atrial size[3].

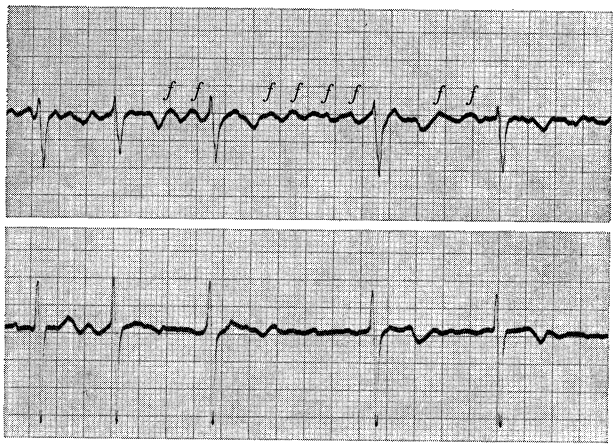

Fig. 1. Leads V_1 and V_2 on an electrocardiogram in a patient with atrial fibrillation.
The f-wave size was measured on lead V_1 of electrocardiogram by averaging total amplitudes of 5 large f-waves.

ANALYSES

The relationships among the age, f-wave size and LAD were studied in both groups.

RESULTS

The sex, age, LAD, and f-wave size in group A are summarized in Table 1.

TABLE 1. Clinical manifestation of the group A

Cases	sex	age	LAD (mm)	f-wave (mm)	classification
1	F	53	52	2.5	MS
2	F	55	33	2.0	MS
3	F	51	45	2.3	MS
4	M	60	64	1.8	MS, MR
5	M	50	42	1.8	MS
6	F	43	45	1.5	MS
7	F	46	48	2.3	MS, MR
8	F	44	45	1.1	MS
9	F	53	56	2.1	MS
10	M	43	38	2.4	MS, MR
11	F	56	34	1.5	MS, AS, AR
12	F	56	50	2.0	MS
13	F	44	54	1.6	MS
14	M	69	56	1.2	MR
15	F	60	56	2.5	MS
16	M	55	42	1.3	MS
17	M	79	46	0.8	MR
18	M	74	54	2.0	MR
19	F	41	48	2.5	MS, MR
20	F	52	53	3.0	MS, MR

MS=mitral stenosis, MR=mitral regurgitation
AS=aortic stenosis, AR=aortic regurgitation

Similarly Table 2 shows the sex, age, LAD and f-wave size in group B.

TABLE 2. Clinical manifestation of the group B

Case	sex	age	LAD (mm)	f-wave (mm)	classification
1	M	56	42	1.5	VSD, AR
2	F	64	16	0.8	IHD
8	M	67	30	1.0	MD,
4	M	57	34	1.3	MD, MR
5	M	69	38	0.8	HT, IHD,
6	F	24	29	1.0	fransient Af
7	M	69	33	1.5	MD
8	M	57	30	0.8	HT
9	M	50	50	1.0	MD
10	M	43	27	1.0	Hyperthyroidism
11	F	71	30	1.5	MD

VSD=ventricular septal defect MD=myocardial disease
IHD=ischemic heart disease HT=hypertension

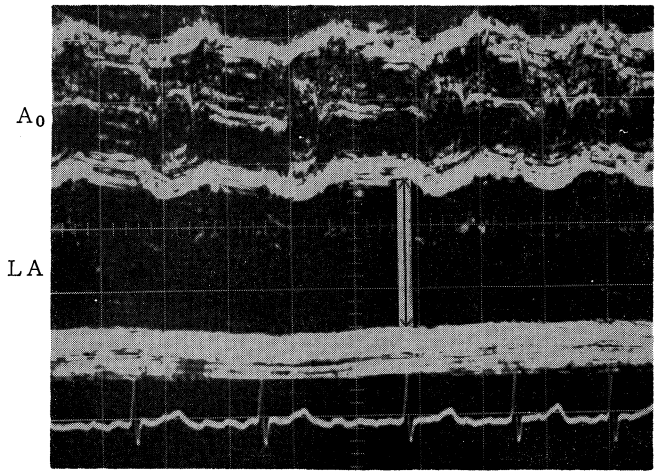

Fig. 2. An echocardiogram showing how to measure left atrial dimension (arrow). Ao=aortic cavity, LA=left atrial cavity.

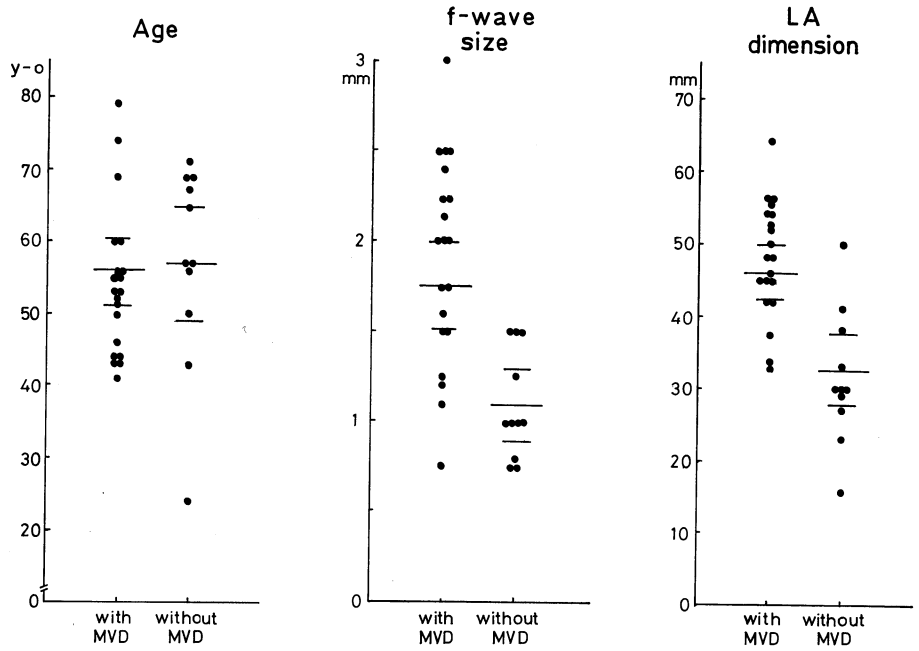

Fig. 3. Comparison of the age, f-wave size and left atrial dimension between group A (with mitral valve disease) and group B (without mitral valve disease). LA=left atrium, MVD=mitral valve disease. See the text.

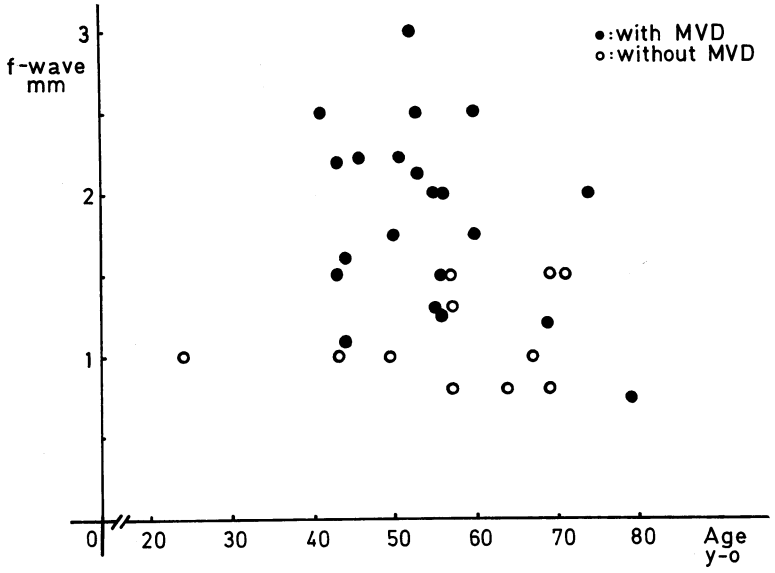

Fig. 4. Correlation of f-wave size with age. Abbreviations see Fig. 3. Refer the text.

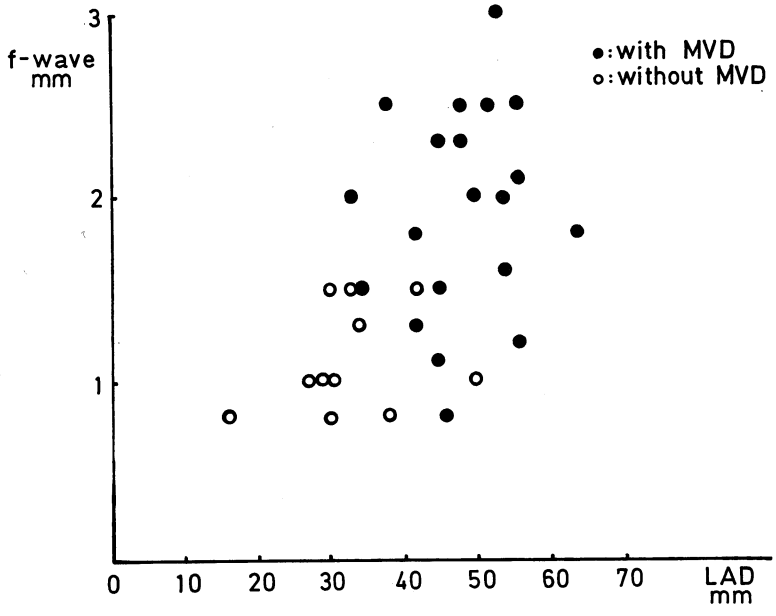

Fig. 5. Correlation of f-wave size with left atrial dimension. Abbreviations see Fig. 3. Refer the text.

The comparison of the age, f-wave size and LAD between group A and group B are shown in Fig. 3. While the age between the two groups did not differ significantly, there was a significant difference ($p < 0.05$) in f-wave size and LAD between the two groups. Both f-wave size and LAD were found to be significantly large in group A.

The correlation of f-wave size with the age between the two groups as shown in Fig. 4 was poor ($r = -0.22$).

The correlation of f-wave size with LAD between the two groups shown in Fig. 5 was weakly positive ($r = +0.53$). On the other hand, in group A there was no significant correlation between f-wave size and LAD ($r = +0.17$).

The following results were obtained from the Fig. 5. Those with f-wave size of greater than 1.5 mm all belonged to group A. Moreover,

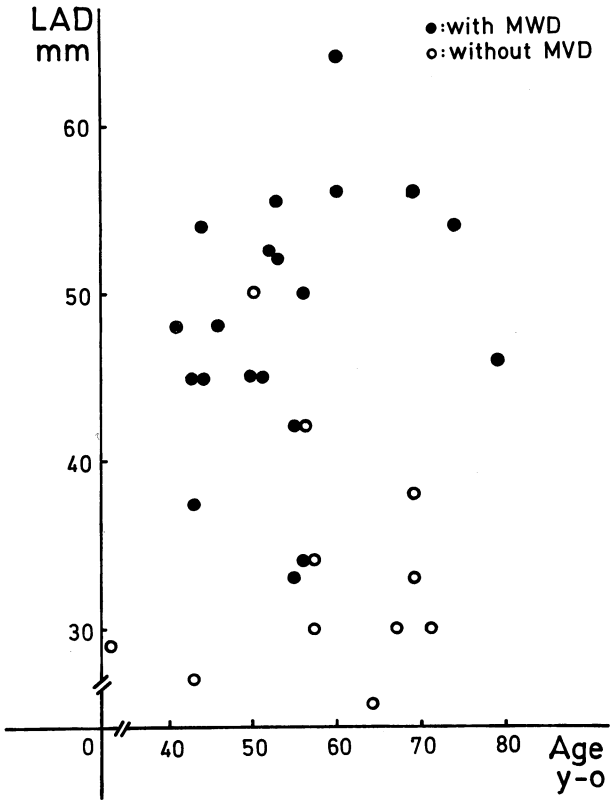

Fig. 6. Correlation of age and left atrial dimension. Abbreviations see Fig. 3. Refer the text.

17 of those 19 cases with LAD of more than 40 mm belonged to group A. All patients with f-wave size of less than 1.5 mm and LAD of less than 40 mm belonged to group B.

The correlation of the age with LAD between the two groups shown in Fig. 6 was also poor ($r = +0.04$).

DISCUSSION

While the comparison of the left atrial size measured by electrocardiogram with by other methods in patients with normal sinus rhythm has been investigated, no literatures on relation of the f-wave size to LAD measured by echocardiogram in atrial fibrillation have been available.

The present results showed that since there was a significant difference in f-wave size between the groups with and without MVD, and was also a significant difference in the left atrial size between the two groups, it may be postulated that the left atrium is significantly greater in MVD. On the other hand, no age difference between the two groups was demonstrated.

Generally, it is believed that the f-wave size is usually coarse in MVD, and in the present study the same result was obtained. According to the available literature, Af is rarely seen (3%) in subjects with LAD of less than 40 mm[4], but in the present investigation 12 cases (38%) with relatively small LAD had Af, and 9 cases (75%) of them belong to group B. From this result it may be said that in patients without MVD Af develops even LAD is small. Moreover, the left atrial enlargement likely causes Af, but it may not necessarily be a single factor.

Among the age, f-wave size and LAD in both groups, f-wave size and LAD were positively correlated ($r = +0.53$) as observed in Fig. 5. Therefore, in cases where f-wave is large, it would be reasonable to assume that the left atrium is enlarged. Nonetheless, some subjects of small f-wave with large LAD, and of large f-wave with small LAD were found. This fact seems to indicate that the factors involved in the f-wave size are multiple.

It is reported that the age is one of the factor causing Af[5], and Af is more frequently seen in subjects over 40 years of age[4]. In the present investigation only one patient under 40 years of age had Af, indicating the similar tendency. However, our result was different from the previous one that f-wave size was small in individuals of advanced age while it was large in younger age[1]. Similarly there was a poor correlation between LAD and age.

As to the factors affecting the onset of Af aside from LAD and age[1,5] just mentioned, the severity and therapeutic effects of congestive heart failure[2,6], the duration of Af[7] and the type of cardiac disease[6,8] have been pointed out.

REFERENCES

1) Thurmann, M. and Janney, J. G. Jr.: The diagnostic importance of fibrillatory wave size. Circulation 25: 991-994, 1962
2) Skoulas, A. and Hoslick, L.: The atrial f-wave in various types of heart disease and its response to treatment. Am. J. Cardiol. 14: 174-177, 1964
3) Hirata, T., Wolf, S. B., Popp, R. L., Helmen, C. H., and Feigenbaum, H.: Estimation of left atrial size using ultrasound. Am. Heart J. 78: 43-48, 1969
4) Henry, W. L., Morganroth, J., Pearlman, A. S., Clark, C. E., Redwood, D. R., Itscoitz, S. B. and Epstein, S. E.: Relation between echocardiographically determined left atrial size and atrial fibrillation. Circulation 53: 273-279, 1976
5) Probst, P., Goldschlager, N. and Selzer, A.: Left atrial size and atrial fibrillation in mitral stenosis. Circulation 48: I282-1287, 1973
6) Thurmann, M.: Coarse atrial fibrillation in congenital heart disease. Circulation 31: 290-292, 1965
7) Culler, M. R., Boone, J. A., Gazes, P. C.: Fibrillatory wave size as a clue to etiological diagnosis. Am. Heart J. 66: 435-437, 1963
8) Davies, M. J. and Pomerance, A.: Pathology of atrial fibrillation in man. Brit. Heart J. 34: 520-525, 1972