ATRIAL FIBRILLATION IN MITRAL STENOSIS AND ITS CORRELATION WITH LEFT ATRIAL SIZE, MITRAL VALVE AREA AND LEFT ATRIAL THROMBUS

ZAFAR NIAZ, ANJUM RAZZAQ, KHURRAM SALEEM, BILAL AZIZ, TAZEEN NAZAR
USMAN MAQSOOD, MIR JALAL-UD-DIN, SAJID ABAIDULLAH AND MUMTAZ HASAN
Department of Medicine, King Edward Medical College / Mayo Hospital, Lahore

Chronic rheumatic heart disease is the commonest cause of mitral stenosis. Incidence of rheumatic MS parallels that of acute rheumatic fever. Atrial fibrillation usually develops in the presence of pre-existing ECG evidence of left atrial enlargement and is related to the size of the chamber, the extent of fibrosis of the left atrial myocardium, the duration of the atriomegaly and the age of the patient. The tendency for development of systemic embolization correlates directly with the patient's age and the size of the left atrial appendages and inversely with the cardiac output. Eighty percent of the patients of MS in whom systemic emboli develop are in atrial fibrillation. A descriptive study was designed in the Department of Medicine, K E Medical College / Mayo Hospital and Punjab Institute of Cardiology, Lahore. A total of 129 conservative cases of mitral stenosis were included in this study, based upon convenient patient sampling. A total of 112 patients were followed up properly, the remaining 17 were lost to follow. The results showed left atrial size and MVA have an inverse correlation (p = 0.017). LAT has a strong association with AF in cases of MS (p = 0.002). The severity of MS does not influence the frequency of AF (p = 0.24). It was thus concluded that left atrial size and MVA have an inverse correlation (p = 0.017). LAT has a strong association with AF in cases of MS (p = 0.002). The severity of MS does not influence the frequency of AF (p = 0.24).

Keywords: *Mitral stenosis MS, left atrial thrombus LAT, mitral valve area MVA, left atrial size.*

INTRODUCTION

Chronic rheumatic heart disease is the commonest cause of mitral stenosis. Incidence of rheumatic MS parallels that of acute rheumatic fever[1]. Rheumatic involvement is present in 99% of the stenotic mitral valves excised at the time of mitral valve replacement. Approximately 25% of all the patients with rheumatic heart disease have pure MS and an additional 40% have combined MS and MR. Two third of all the patients with rheumatic MS are women[2]. It is much commoner and present earlier in the Middle East, Indian sub-continent and far East than in the West[1]. Atrial fibrillation usually develops in the presence of pre-existing ECG evidence of left atrial enlargement and is related to the size of the chamber, the extent of fibrosis of the left atrial myocardium, the duration of the atriomegaly and the age of the patient[2]. 50%-80% of the patients develop paroxysmal or chronic atrial fibrillation; until the ventricular rate is controlled, it may precipitate dyspnoea or pulmonary oedema[3].

A small percentage perhaps 15% of patients with MS experience chest discomfort. The tendency for development of systemic embolization correlates directly with the patient's age and the size of the left atrial appendage and inversely with the cardiac output. 80% of the patients of MS in whom systemic emboli develop are in atrial fibrillation[2]. Transesophageal echocardiography is particularly useful for demonstrating thrombus in the body of the left atrium or in the left atrial appendix. Spontaneous contrast within the left atrial cavity is probably due to stasis resulting from a combination of atrial fibrillation, low forward flow and increased cavity size. It indicates increased risk of thrombus formation[1].

PATIENTS AND METHODS

This descriptive study was conducted in the setting of Mayo Hospital, Lahore and Punjab Institute of Cardiology, Lahore. Patients were selected for interview on the basis of convenient sampling. The data was collected on a specially designed performa. One hundred and twenty nine consecutive patients of echocardiographically proved mitral stenosis, visiting the two institutions were contacted and the performa was filled for each patient.

The data was later scrutinized and only 112 cases were included in the final workup.

All the patients were investigated with an ECG and an echocardiogram (to confirm mitral stenosis and to measure anteroposterior left atrial dimensions on M-mode). All patients who were suffering from AF due to causes other than predominant mitral stenosis were excluded. Clinical analysis helped rule out non-cardiac causes of AF. Cardiac causes of AF other than MS were ruled out on the basis of echocardiography and ECG. Those cases of mitral stenosis that did not have a complete record, including treatment history and previous ECGs, were also excluded. Similarly the data of the patients, who had been interfered with either surgically or PTMC, was entered on the basis of their pre-surgical record.

The data analysis was computer based. SPSS 10 was employed for this purpose. The significance of the findings was tested through Student's "T" test.

RESULTS

A total of 112 patients with echocardio-graphically proved predominant MS, who visited Mayo Hospital and Punjab Institute of Cardiology, Lahore, were studied. The age of these patients ranged from 7 to 73 years (mean age 28.88 ± 12.50). 42 (37.5%) of them were males and 70 (62.5%) were females. Out of 112 patients, 61 patients (54.5%) had pure MS, 51 patients (45.5%) had associated mild mitral regurgitation as recorded on Doppler examination.

The mitral valve area ranged from 0.5 to 3.10 cm^2 with a mean value of 1.0469 ± 0.4146 cm^2. Only one patient had MVA of less than 0.5 cm^2. Using the general terminology of severity of MS, mild MS (MVA > 1.5 cm^2) was seen in 14 cases (12.5%), moderate MS (MVA between 1.5–1.1 cm^2) in 24 cases (21.4%) and severe MS (MVA ≤ 1.0 cm^2) in 74 cases (66.1%). No obvious correlation (p=0.24) could be discovered between AF and the severity of MS.

The left atrial size ranged from 33 to 80 mm (mean 50.91 ± 8.66). Thus using the value of 45 mm as a definite indicator of left atrial enlargement, 54 patients (48.2%) were found to have left atrial enlargement. The correlation between AF and left atrial size was significant (p=0.000). This was plotted on the scattergram, which shows a steep rise in the frequency of AF beyond a left atrial size of 70 mm.

No case of AF was recorded at a left atrial size of 40 mm, or less. Even at the cutoff value of 45 mm, only 2 cases (1.78%) had AF. There was a definite inverse correlation between the left atrial size and the MVA (p=0.017), which when plotted on a scattergram, showed a linear trend. The frequency of AF was found to increase with age (p=0.000).

The left atrial size in patients with AF was larger than those in normal sinus rhythm; the mean value in AF being 56.72 ± 9.41 mm (range 42-80 mm) as compared to 48.88 ± 7.43 mm (33-67 mm) in sinus rhythm. Left atrial thrombus (LAT) was discovered in only 6 patients (5.36%). There was a very strong association between AF and LAT (p=0.002) as 5 out of 6 patients (83.3%) had AF. The left atrial size in this group ranged between 42-66 mm (mean 55.53 ± 8.16) and the MVA between 0.7-1.10 cm^2 (mean 0.9833 ± 0.1472). The left atrial size in the patients without LAT was significantly less than those with LAT (mean 50.66 ± 8.66 mm). Similarly, the MVA was more in patients without the LAT (mean 1.0505 ± 0.4248 cm^2).

DISCUSSION

The objective of this study was to calculate the frequency of AF in cases of MS and its correlation with left atrial size, mitral valve area and left atrial thrombus.

Sixty one (54.5%) of our patients had pure MS whereas the rest (45.5) had associated mild MR diagnosed on Doppler study. Sagie et al[4] reported that at least 78% of cases with MS had minimal / mild MR detected on Doppler study and only 22% had pure MS. Using the general terminology of severity of MS, mild MS (MVA > 1.5 cm^2) was seen in 14 cases (12.5%), moderate MS (MVA between 1.5-1.1 cm^2) in 24 cases (21.4%) and severe MS (MVA ≤ 1.0 cm^2) in 74 cases (66.1%). Sagie et al[4] noted mild MS in 28%, moderate MS in 34% and severe MS in 38% cases. Our group had MVA in the range of 0.5-3.1 cm^2 (mean 1.0469 ± 0.4146). The males had a mean value of 1.031 ± 0.4807 cm^2 and the females 1.0564 ± 0.3728 cm^2. Yetkin et al[5] noted mean MVA in males as 0.97 ± 0.22 cm^2 and in females as 1.09 +/- 0.25 cm^2.

We could not find a correlation between the severity of MS and AF (p=0.24) as already reported by Keren et al[6]. In our study, MVA in MS + AF was 1.0624 ± 0.3525 cm^2 and MS + NSR (normal sinus rhythum) was 1.0414 ± 0.436 cm^2. The left atrial size in our study ranged from 33-80 mm (mean 50.91 ± 8.66). 54 (48.2%) of our patients had definite left atrial enlargement (45 mm or more). The mean left atrial size calculated in valvular heart disease (79.4% pure MS) by Nadeem et al[7] was 52.44 +/- 8.96 mm.

No case of AF was noted below 40 mm and only two cases (1.78%) below the 45 mm mark in our study. Mirozowska et al[8] made a similar observation.

We found an inverse correlation between the left atrial size and MVA (p = 0.017) Probst et al[9] made a similar inference, although they did not label MVA as the prime determinant of left atrial size. The left atrial size in patients with AF (mean 56.72 mm ± 9.41) was larger than those in sinus rhythm (mean 48.88 mm ± 7.43). Keren et al[6] reported left atrial size in MS + AF as 37.6 cm^2 ± 10.8 as compared to MS + sinus rhythm as 27.8 cm^2 ± 7.7.

In our study, only 6 (5.36%) patients had LAT and 5 (83.3%) of 6 (p = 0.002) of these patients were in AF. The frequency of LAT in patients with AF was therefore 17.2% (5/29) and 1.2% in patients with NSR. Acarturk et al[10] reported LAT in patients with AF as 20.8% as compared to 2.6% in sinus rhythm. The left atrial size in patients with LAT was 55.33 ± 8.16 mm as compared to 50.66 ± 8.66 mm in NSR. The MVA in patients with LAT was 0.9833 cm^2 ± 0.1472 as compared to 1.0505 cm^2 ± 0.4248 in patients without LAT. Acarturk et al[10] noted larger left atrial size and smaller MVA in patients who developed embolic events.

It was **concluded** that the left atrial size and MVA have an inverse correlation. LAT has a strong association with AF in cases of MS. The severity of MS does not influence the frequency of AF.

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